Acer | HDS AMS200

User and Reference Guide

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- Changed Table C.1

Preface

This document describes the physical, functional, and operational characteristics of the AMS200 subsystem. This document also provides operation instructions, installation details, and configuration planning information for the AMS200 subsystem.

This User and Reference Guide assumes:

- The user is familiar with the Acer | HDS AMS200™ array subsystem, and
- The user is familiar with the Windows® 95, Windows® 98, Windows® 2000, or Windows NT® operating systems. These versions are abbreviated to **Windows** in this document.

This subsystem complies with FDA radiation performance standards 21CFR, subchapter J.

Notes:

- For further information, please contact your Hitachi Data Systems account team, or visit the Hitachi Data Systems worldwide web site at http://www.hds.com.
- The use of Acer | HDS AMS200 subsystem and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Software Version

This document revision applies to Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Products version 2.0 and higher.

EMI Regulation

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference in which case the user will be required to correct the interference at his own expense. Testing was done with shielded cables. Therefore, in order to comply with the FCC regulations, you must use shielded cables with your installation.

If trouble occurs in a different configuration, the user may be requested to take appropriate preventive measures. The EMI test was done in the following configuration:

- AMS200-RKS+H1J
- AMS200-RKS+RKAJ+H2J

Convention for Storage Capacity Values

This document uses the following convention for storage capacity values:

1 KB (kilobyte) = 1,000 bytes
1 MB (megabyte) = 1,000,000 bytes
1 GB (gigabyte) = 1,000,000,000 bytes
1 TB (terabyte) = 1,000 Gbytes

Referenced Documents

Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Cache Residency Manager Software User's Guide

Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Navigator Modular Graphical User Interface (GUI) User's Guide

Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Navigator Modular Command Line Interface (CLI)

Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage ShadowImage™ In-System Replication Software User's Guide

Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage TrueCopy™ Synchronous Remote Replication Software User's Guide

Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Copy-on-Write SnapShot User's Guide

Acer | HDS AMS200 and WMS100 *Global 19-Inch Rack Reference Guide*

Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Performance Monitor Software User's Guide

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Chapter 1 Overview of the AMS200 Subsystem

This chapter includes the following:

- Overview Features (see section 1.1)
- Rack-Mount Model (see section 1.2)
- Floor Model (see section 1.3)

This chapter provides information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide an explanation for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
1.1	Overview Features	○	○	○
	1.1.1 High Data Availability	○	○	○
	1.1.2 Connectivity	○	○	○
	1.1.3 Scalability	○	○	○
	1.1.4 Performance Reporting and Monitoring	○	○	○
	1.1.5 Reliability, Availability, and Serviceability	○	○	○
	1.1.6 Hitachi Freedom Storage™ and Hitachi Freedom Data Networks™	○	○	○
1.2	Rack-Mount Model	○	○	○
1.3	Floor Model	○	–	○

○: An explanation is provided.
—: An explanation is not provided.

1.1 Overview Features

The Acer | HDS Adaptable Modular Storage AMS200 subsystem (hereafter referred to as the AMS200) is available in two models: the floor model and the rack-mount model.

There are two types of the AMS200 floor model. The first type is a combination of the DF700-RKS (hereafter referred to as the RKS) and the floor standing kit DF-F700-H1J (hereafter referred to as the Floor [RKS+H1J] Model). The second type is a combination of the RKS, the DF700-RKAJ (hereafter referred to as RKAJ), and the floor standing kit DF-F700-H2J (hereafter referred to as the Floor [RKS+RKAJ+H2J] Model).

The AMS200 rack-mount model is a subsystem that combines the RKS, RKAJ/RKAJAT, and the DF-700-RKNAS2G (hereafter referred to as RKNAS). For information regarding model types, see sections 1.2 and 1.3.

The following AMS200 subsystem features are discussed in this section:

- High Data Availability
- Connectivity
- Scalability
- Performance Reporting and Monitoring
- Reliability, Availability, and Serviceability
- Hitachi Freedom Storage™ and Hitachi Freedom Data Networks™

1.1.1 High Data Availability

The AMS200 is designed for high performance and protection of user data. See section 1.2 for additional information on the reliability and availability features of the Acer | HDS AMS200 subsystem.

1.1.2 Connectivity

The Acer | HDS AMS200 subsystem provides connectivity to most open systems through a standard Fibre Channel interface or Network interfaces. The following describes the features of Fibre Channel and Ethernet.

- **High-Speed Data Transfer**

Fibre Channel: When using the Fibre Channel for the host interface, the AMS200 subsystem can transfer data between the host computer and the subsystem at a maximum speed of 200 MB/sec. (400 M bytes/s when the optional interface is connected). Throughput can be accessed by connecting multiple devices through the Fibre Channel Switch even when accessing multiple hosts.

Ethernet: With the 1 G bps Ethernet connection, the subsystem can transfer data between host computer and the subsystem at a maximum speed of 100 M bytes/s per port via a network. Enough throughput can be obtained even when having multiple access to the multiple devices connected to the same network loop.

- **Cable**

Fibre Channel: With Fibre Channel, the subsystem can be located up to 300 meters from the host.

Ethernet: With Ethernet, the subsystem can be located up to 100 meters from the host. The subsystem can be installed in the location far from the host.

- **The Number of Connectable Devices**

Fibre Channel: The AMS200 subsystem enables you to construct a system which can connect up to 126 fibre channel devices by using the fibre channel interface and connecting the FC-AL and the FC-SW.

- **Security Function**

Fibre Channel and Ethernet: When the system is configured to connect multiple hosts, a function is provided which rejects a boot by any host except a specified host. This function can prevent access from an illegal host.

1.1.3 Scalability

The architecture of the AMS200 enables the user to scale the subsystem to meet a wide range of capacity and performance requirements:

- You can construct a variety of systems; for example, a system with 15 disk drives can be configured using a single RKS, or a more complex system can be set up using the maximum of 105 disk drives, expanded by connecting up to 6 RKAJs/RKAJATs to the RKS.
- Up to 15 spare disks can be set up in any location. Use the system effectively by configuring each spare disk in a disk drive slot left unused due to system construction.
- From the host computer, the subsystem can be used as a single large-scale disk drive or as 512 logical disks (LUs) maximum.

1.1.4 Performance Reporting and Monitoring

The Storage Navigator-Modular program provides the capability to either monitor the disk array in real-time or to collect historical data regarding the performance of the disk array.

1.1.5 Reliability, Availability, and Serviceability

The AMS200 subsystem is not expected to fail in any way that would interrupt user access to data. The AMS200 can sustain single component failures and still continue to provide full access to all stored user data.

Note: While access to user data will not normally be compromised, the failure of any single key component may degrade performance.

The reliability, availability, and serviceability features of the AMS200 subsystem include:

- **High-Availability capability.** The AMS200 subsystem provides high-availability capability for all critical components. The AMS200 uses component and function redundancy to provide high availability for many subsystem components.

  The Controller of the AMS200 subsystem increases data reliability by adding original 8-byte data assurance codes to data from a host computer by automatically generating them, writing them in the disk drive together with the data, and checking them when reading the data. On the data bus in the controller, the automatic generation of the data assurance codes and the check are executed to enhance data reliability in data distribution/concentration control, particular to that disk array.

  This function monitors potential disk failure. Before failure occurs, the data copy operation can be automatically performed in the background. The dynamic sparing feature enables the subsystem to replace the spare disk due to redundancy (excluding RAID0 configuration) and provides high reliability.

- **Redundant power supply systems.** Each AMS200 unit has a set of two power supplies. Each power supply can provide power for the entire subsystem in the unlikely event of power supply failure. The power supplies of each set can be connected across power boundaries so that each set can continue to provide power if a power outage occurs. Each unit of the AMS200 can sustain the loss of a single power supply and still continue operation.

- **High capacity cache.** The AMS200 subsystem supports 2 GBs high capacity cache per controller. Writing completion can be reported to the host system when data is written to cache.

1.1.6 Hitachi Freedom Storage™ and Hitachi Freedom Data Networks™

Hitachi Data Systems' end-to-end Storage Solutions give you the freedom to locate storage wherever it makes the greatest business sense to do so and protect your investment in currently installed components. Made possible by the advent and proliferation of high-speed technologies, storage area networks break the traditional server/storage bond and enable total connectivity. As a result, you can consolidate large storage pools shareable across the enterprise, centralize management, and dramatically improve storage utilization while reducing costs.

Hitachi Data Systems' Storage Solutions enable you to increase data availability, counter spiraling information management costs, and take advantage of the speed and flexibility of Storage technology. In addition to supporting the Storage Networking Industry Association's open-systems standards, HDS Storage Solutions reduce total cost of ownership by minimizing support costs and downtime, and optimizing server and storage configurations.

The benefits of Hitachi Data Systems' Storage Solutions include:

- Server/storage system scalability.
- Improved information access.
- Enhanced application/backup performance.
- Increased resource manageability and reliability.
- Higher availability.

Hitachi Freedom Data Networks™ (FDN) responds to the challenge of open architecture and multiple platforms. FDN is the locus of Hitachi's long-term vision for offering businesses complete freedom of choice in establishing data-centric enterprise networks, encompassing storage, switches, servers, management software, protocols, services, and networks developed by Hitachi, our alliance partners, and third party providers.

FDN facilitates:

- Consolidation of server and storage resources.
- Data sharing across the enterprise.
- Centralized resource and data management.
- Superior data security.
- Increased availability and scalability.
- Business continuity and disaster recovery.

For further information on Freedom Storage and Freedom Data Networks, please contact your Hitachi Data Systems account team, or visit Hitachi Data Systems online at www.hds.com.

1.2 Rack-Mount Model

The rack-mount model is composed of a single RKS or a combination of the RKS, RKAJ/RKAJAT, and RKNAS mounted on a rack frame. The RKS is capable of mounting up to 15 disk drives; a controller to perform RAID control on the drives is included. The RKAJ/RKAJAT is capable of mounting up to 15 disk drives and controls the drives through a connection with an RKS. The RKAJ/RKAJAT is provided with no controller.

1.3 Floor Model

There are two floor model styles:

- Floor (RKS+H1J) Model.
- Floor (RKS+RKAJ+H2J) Model.

The Floor (RKS+H1J) Model is capable of mounting up to 15 disk drives and include a controller to perform RAID control on the drives. The Floor (RKS+RKAJ+H2J) model is capable of mounting up to 30 disk drives and includes a controller to perform RAID control on the drives.

Note: For the specifications of the Floor model, refer to Chapter 2.

Chapter 2 Planning for Installation and Operation

This chapter provides information for planning and preparing a site before and during installation of the Acer | HDS AMS200 subsystem. Please read this chapter carefully before beginning your installation planning.

Note: The general information in this chapter is provided to assist in installation planning and is not intended to be complete. The internal AMS200 installation and maintenance documents used by Acer | HDS personnel contain complete specifications. The exact electrical power interfaces and requirements for each site must be determined and verified to meet the applicable local regulations. For further information on site preparation for AMS200 installations, contact your Acer | HDS account team or the Acer | HDS Support Center.

This chapter includes the following:

- User Responsibilities
- Safety Precautions
- Dimensions and Weight
- Service Clearance Requirements
- Floor Load Rating
- Cable Requirements
- Environmental Specifications

This chapter provides information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide explanations for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
2.1	User Responsibilities	○	○	○
2.2	2.2.1 Symbol Marks	○	○	○
	2.2.2 Repair, Modification, and Diasasembly	○	○	○
	2.2.3 Precautions for Using the Equipment	○	○	○
	2.2.4 Precautions for Inspection and Cleaning	○	○	○
	2.2.5 Emergency Precautions	○	○	○
	2.2.6 Warning Notices	○	○	○
	2.2.7 Locations of Warning Labels on the Equipment	○	○	○
2.3	2.3.1 Dimensions and Weight	○	○	○
	2.3.2 Service Clearance Requirements	○	○	○
	2.3.3 1 Floor Load Rating for the AMS200 Rack-Mount Model	○	○	○
	2.3.3 1 Floor Load Rating for the AMS200 Floor Model	○	–	○
	2.3.4 Internal Logic Specifications	○	○	○
	2.3.5 Cable Function	○	○	○
2.4	2.4.1 Environmental Hazards	○	○	○
	2.4.2 Temperature and Humidity Requirements	○	○	○
	2.4.3 Input Power and Insulation Performance Specifications	○	○	○
	2.4.4 Air Flow Requirements	○	○	○
	2.4.5 Vibration and Shock Tolerances	○	○	○
	2.4.6 Reliability	○	○	○

○: An explanation is provided.
—: An explanation is not provided.

2.1 User Responsibilities

Before the AMS200 subsystem arrives for installation, you must provide the following items to ensure proper installation and configuration:

- Physical space necessary for proper subsystem function and maintenance activity
- Electrical input power
- Connectors and receptacles
- Air conditioning
- Floor ventilation areas (recommended but not required)
- Cable access holes

2.2 Safety Precautions

When using the AMS200 disk array subsystem, follow these cautionary procedures:

- Perform operations in accordance with the instructions or procedures described in this manual.
- Follow the cautionary notes written on labels affixed to the equipment.
- Follow the cautionary notes written in this manual.
- This disk array is a **class 1 laser system** which does not emit a hazardous laser beam. Operate this subsystem using the instructions included in this guide; do not perform operations that are not specified. Otherwise, unexpected failures or accidents may result.

It is impossible to describe every hazard that may exist with this equipment. Please be aware of hazards not described in this manual. Work safely.

The following information is included in this section:

- Symbol marks
- Repair, modification, and disassembly
- Precautions for using the equipment
- Precautions for inspection and cleaning
- Emergency precautions
- Warning notices

2.2.1 Symbol Marks

The warning labels which appear on the subsystem and/or in this guide indicate potential safety hazards. When you see these symbols, observe the safety instructions that follow:



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER — Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING — Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION — Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION — Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

2.2.2 Repair, Modification, and Disassembly

Users must not repair, remodel, or disassemble the equipment. Such actions may cause hazardous conditions for the user and/or the equipment.

2.2.3 Precautions for Using Equipment

Use special precautions for the following:

- Equipment
- Cables
- Air vents
- Battery unit
- Nickel-Hydride rechargeable battery instructions
- Miscellaneous and other

2.2.3.1 Equipment

- If you notice unusual heat generation, odors, or smoke emission, shut off the power feed to the equipment and contact the Customer Engineer. Leaving such conditions unattended may result in hazardous physical conditions and equipment failure.
- Avoid physical disruption to the equipment. This may result in hazardous physical conditions and equipment failure.
- Do not place heavy objects on top of the disk array. Avoid using the equipment for any use other than its original purpose; otherwise, an injury or equipment failure may result.

2.2.3.2 Cables

- Avoid obstructing walkways when routing cables.
- Do not allow heavy material to be placed on cables. Do not place cables near any apparatus that generates heat. Do not step on or subject cables or connectors to shearing or pulling forces; the cable jacket can be damaged and can break, resulting in an electric shock, fire, or loss of data.
- Make sure that electrical and signal cables are clean before connecting them. Any dirt on a connector should be removed before inserting the connector into a socket.

2.2.3.3 Air Vents

- Make certain that the air vents are free of obstruction. They should be inspected periodically.
- Do not place metallic material such as paper clips or any combustible material such as paper into or near the air vents. This may result in electric shock or fire.

2.2.3.4 Battery Unit

Observe the following when handling the battery:

- Do not disassemble or tamper with the battery.
- Do not allow the battery to be physically damaged. If the battery is physically damaged, have it replaced as soon as possible.
- Do not connect the two terminals of the battery directly to each other; this will create a short circuit.
- Do not tamper with cable insulation.
- Do not connect the battery to any equipment other than the AMS200 subsystem.
- Do not expose the battery to high temperatures.
- Use only the specified battery.

2.2.3.5 Nickel-Hydride Rechargeable Battery Instructions

These instructions explain what you must observe when you use a nickel-hydride rechargeable battery (hereafter it is referred to as the battery). If you use the battery incorrectly, it can overheat ignite, burst or explode, damaging and deteriorating its performance/life. Read and follow the instructions below:

⚠ Danger

1. Do not disassemble the case; do not modify it or peel off the label. There are high voltage parts inside: if you attempt any of these actions, this can result in electrical shock or burning.
2. Do not disassemble the battery; this can cause short circuits inside or outside of the battery. If the components are exposed to the air, the battery can overheat, burst or ignite. Disassembling the battery can expose you to alkaline solution, which can be dangerous.
3. Do not cut the output cable. Do not modify the connector. If you attempt any of these actions, an electrical shock or burn can result. A short-circuit may cause abnormal chemical reactions inside the battery which leads to overheating, bursting or ignition.
4. Follow the instructions when you recharge the battery pack. If you recharge it in a way different from specified here, it may cause the following problems: The battery may become charged excessively; excessive current may be produced; or the battery cannot be recharged. As a result, the battery may leak, become overheated, burst, or ignite.
5. Do not use excessive force when you connect the battery pack to the charger or other devices. If you cannot connect it easily, check that the positive and negative positions are correct for the connector. If you connect the battery in reverse, it will be charged incorrectly and abnormal chemical reactions may occur inside. As a result, the battery may become overheated, burst or ignite.
6. Do not connect the battery to a power receptacle. If you apply an excessive amount of voltage to the battery, it may produce excessive current making the battery overheat, burst or ignite.
7. Do not use or leave the battery where the temperature can become high, such as, near a fire or a heating element. High temperatures can damage the battery's separator, which may cause short circuit, making it overheat, burst or ignite.
8. Do not incinerate or heat the battery pack. If you do so, the insulator may melt, the safety fuse/mechanism may be damaged, or the electrolyte may gush out. As a result, the battery can burst, explode or ignite.
9. Do not connect the negative terminal to the positive with metal wire. Do not carry or store the battery with other metal parts. This can cause a short circuit or produce an excessive current which can cause the battery to leak, overheat, burst or ignite.
10. Do not let the battery become wet by soaking it in the water or seawater. If the battery becomes wet, a short circuit can occur and an excessive amount of current can be produced, causing abnormal chemical reactions inside. As a result, the battery may become overheated, burst or ignite.

11. Do not nail or hammer the battery. The battery may be broken or dented and a short circuit may occur inside. As a result, the battery may become overheated, burst or ignite.
12. Do not solder directly to the battery. If you do so, heat will melt the insulator and damage the safety fuse/mechanism. As a result, the battery may leak or may become overheated, burst or ignite.

Warning

1. If you find anything strange or unusual with the battery when you use/carry/store it, remove the battery from the device and stop using it. For example, strange smells, strange colors, or deformation are a sign you must stop using the battery.
2. If it takes longer than the specified time to complete recharging, stop recharging the battery; otherwise, the battery may become overheated, burst or ignite.

If the battery leaks and gets into your eyes, immediately flush your eyes with clean water (tap water) and do not rub your eye. Visit the doctor immediately. If you do not seek any treatment for your eyes, problems may occur later. Because the battery uses highly concentrated alkaline as electrolyte, it can burn; you may lose your sight if it makes contact with your eyes. If the battery's liquid contacts your skin or eyes, you must flush them with plenty of clean water and visit a doctor at once.

2.2.3.6 Miscellaneous and Other

When a failure occurs in the unit, take action according to the procedures recommended in this manual. If the difficulty does not correspond to the corrective measures documented in this manual, contact the Customer Engineer.

2.2.4 Inspection and Cleaning Precautions

- If a maintenance activity requires that the unit be powered off, make sure that the power-off sequence described in the manual is performed before proceeding with maintenance.
- Do not work on the unit in a damp or flooded environment.
- Do not obstruct access to the unit with parts or tools.
- When performing the work with the door open, take off metal watches or jewelry to prevent electric shock. If you wear metal-frame glasses, do not touch the equipment.
- Ensure that loose clothing, jewelry, or hair do not become tangled in moving components.
- There are high-voltage parts in the equipment. Observe the cautionary statements in the manual to make sure that high-voltage components are not touched during maintenance. Another person should be on alert to shut off the power feed to the equipment.
- After the power feed to the equipment is shut off, electricity remains in the equipment for a period of time. Therefore, do not touch any components other than those indicated in this manual.
- The equipment can become extremely hot. Do not touch any part other than those indicated in this manual.
- When working with the door open, wear cotton gloves to prevent your hands from touching sharp objects.

2.2.5 Emergency Precautions

Follow these emergency precautions for the following:

- Electric Shock
- Fire

2.2.5.1 Electric Shock

- Do NOT immediately touch the person struck by electricity. You could be the second victim.
- To shut off the electric flow to a victim, disconnect the power feed cable of the equipment. In spite of this action, electricity may not be shut off. Separate the victim from the current source by using a non-conductive material such as dry wooden bar.
- Call an ambulance.
- When the victim has lost consciousness, practice artificial respiration on the victim. To prepare for such a case, learn how to practice artificial respiration.
- When the victim's heart has stopped, give a heart massage. This treatment should only be conducted by a person who has been trained and qualified.

2.2.5.2 Fire

- To shut off the electric flow to the equipment, pull out the power feed cable. This will terminate the power supply.
- If a fire cannot be extinguished when the electric flow has been shut off, use fire-fighting procedures and contact the fire department.

2.2.6 Warning Notices

2.2.6.1 Caution Statements

Caution statements described in this manual and the pages where they appear are listed below. Caution statements are indicated by the caution symbol:

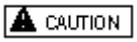


Table 2.1 Caution Statements

Warning Statement	Corresponding Page
Cooling fans rotate at a high speed. Keep body parts and loose clothing away from the cooling fans.	18
When cleaning, take care not to touch electrically charged parts. Electric shock may result.	18, 19
Do not touch electrically charged components during parts replacement. Electric shock may result.	19

2.2.7 Warning Label Locations

Warning labels are pasted on sections of equipment which require special care. Read the messages and observe the warning procedures. They are shown in the following figures:

- Floor Model RKS+H1J
- Floor Model RKS+RKAJ+H2J
- Rack-Mount Model RKS
- Rack-Mount Model RKAJ/RKAJAT

Table 2.2 lists and describes the symbols contained in warning labels.

Table 2.2 Symbols Contained in Warning Labels

Symbol Mark	Description
	Caution-electric shock.
	Caution-very hot.

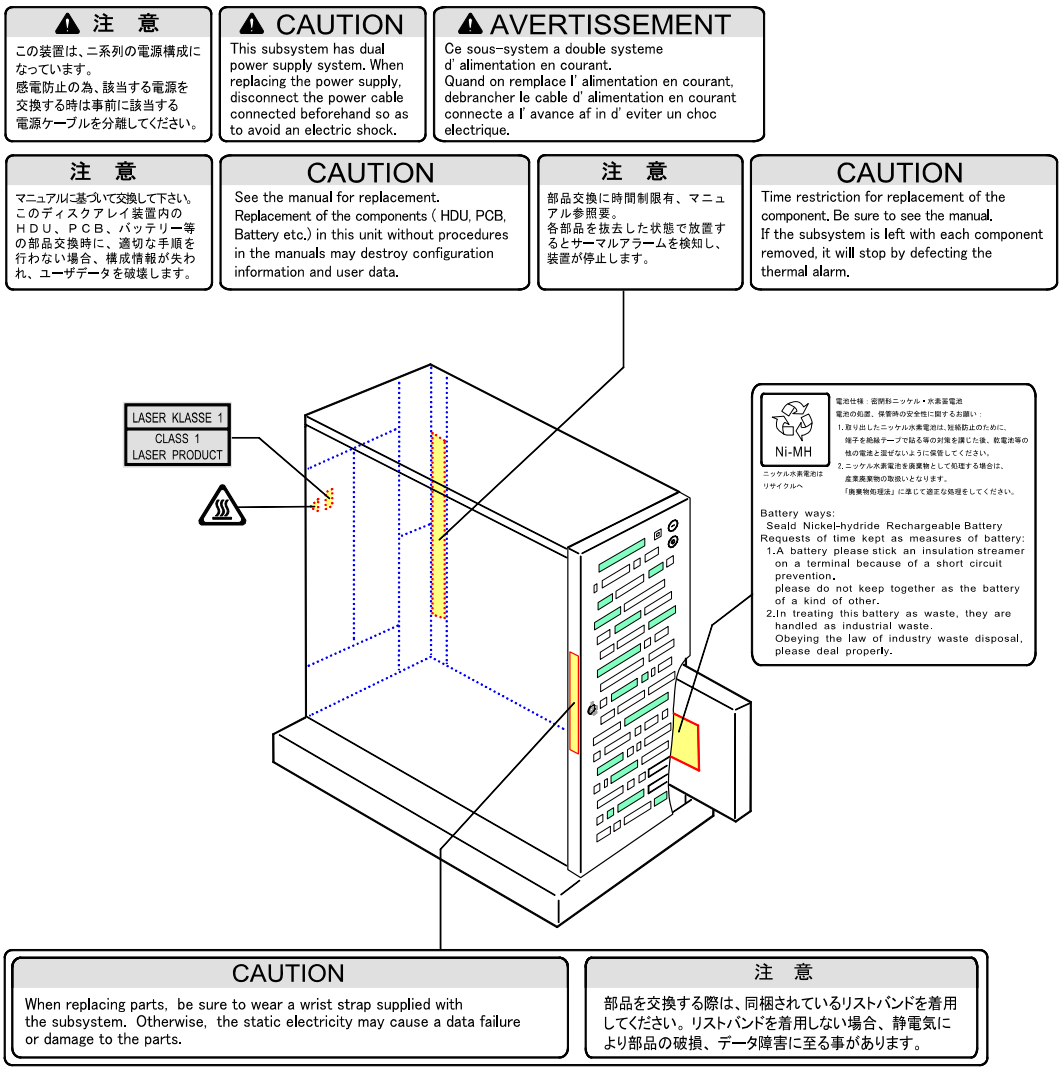

注　意
この装置は、ニ系列の電源構成になっています。
感電防止の為、該当する電源を交換する時は事前に該当する電源ケーブルを分離してください。
CAUTION
This subsystem has dual power supply system. When replacing the power supply, disconnect the power cable connected beforehand so as to avoid an electric shock.
AVERTISSEMENT
Ce sous-system a double systeme d' alimentation en courant.
Quand on remplace l' alimentation en courant, debrancher le cable d' alimentation en courant connecte a l' avance af in d' eviter un choc electrique.
注　意
マニュアルに基づいて交換して下さい。
このディスクアレイ装置内のＨＤＵ、ＰＣＢ、バッテリー等の部品交換時に、適切な手順を行わない場合、構成情報が失われ、ユーザデータを破壊します。
CAUTION
See the manual for replacement.
Replacement of the components (HDU, PCB, Battery etc.) in this unit without procedures in the manuals may destroy configuration information and user data.
注　意
部品交換に時間制限有、マニュアル参照要。
各部品を抜去した状態で放置するとサーマルアラームを検知し、装置が停止します。
CAUTION
Time restriction for replacement of the component. Be sure to see the manual.
If the subsystem is left with each component removed, it will stop by defecting the thermal alarm.
LASER KLASSE 1
CLASS 1
LASER PRODUCT
Ni-MH
ニッケル水素電池は
リサイクルへ
電池仕様：密閉形ニッケル・水素蓄電池
電池の起源、保管時の安全性に留するお願い：
1.取り出したニッケル水素電池は、短絡防止のために、
端子を絶縁テープで貼る等の対策を講じた後、乾電池等の
他の電池と混ぜないように保管してください。
2.ニッケル水素電池を廃棄物として処理する場合は、
産業廃棄物の取扱いとなります。
「廃棄物処理法」に準じて適正な処理をしてください。
Battery ways:
Seald Nickel-hydride Rechargeable Battery
Requests of time kept as measures of battery:
1.A battery please stick an insulation streamer on a terminal because of a short circuit prevention.
please do not keep together as the battery of a kind of other.
2.In treating this battery as waste, they are handled as industrial waste.
Obeying the law of industry waste disposal, please deal properly.
CAUTION
When replacing parts, be sure to wear a wrist strap supplied with the subsystem. Otherwise, the static electricity may cause a data failure or damage to the parts.
注　意
部品を交換する際は、同梱されているリストバンドを着用してください。リストバンドを着用しない場合、静電気により部品の破損、データ障害に至る事があります。

Figure 2.1　Positions and Contents of Labels on Floor Model RKS+H1HJ

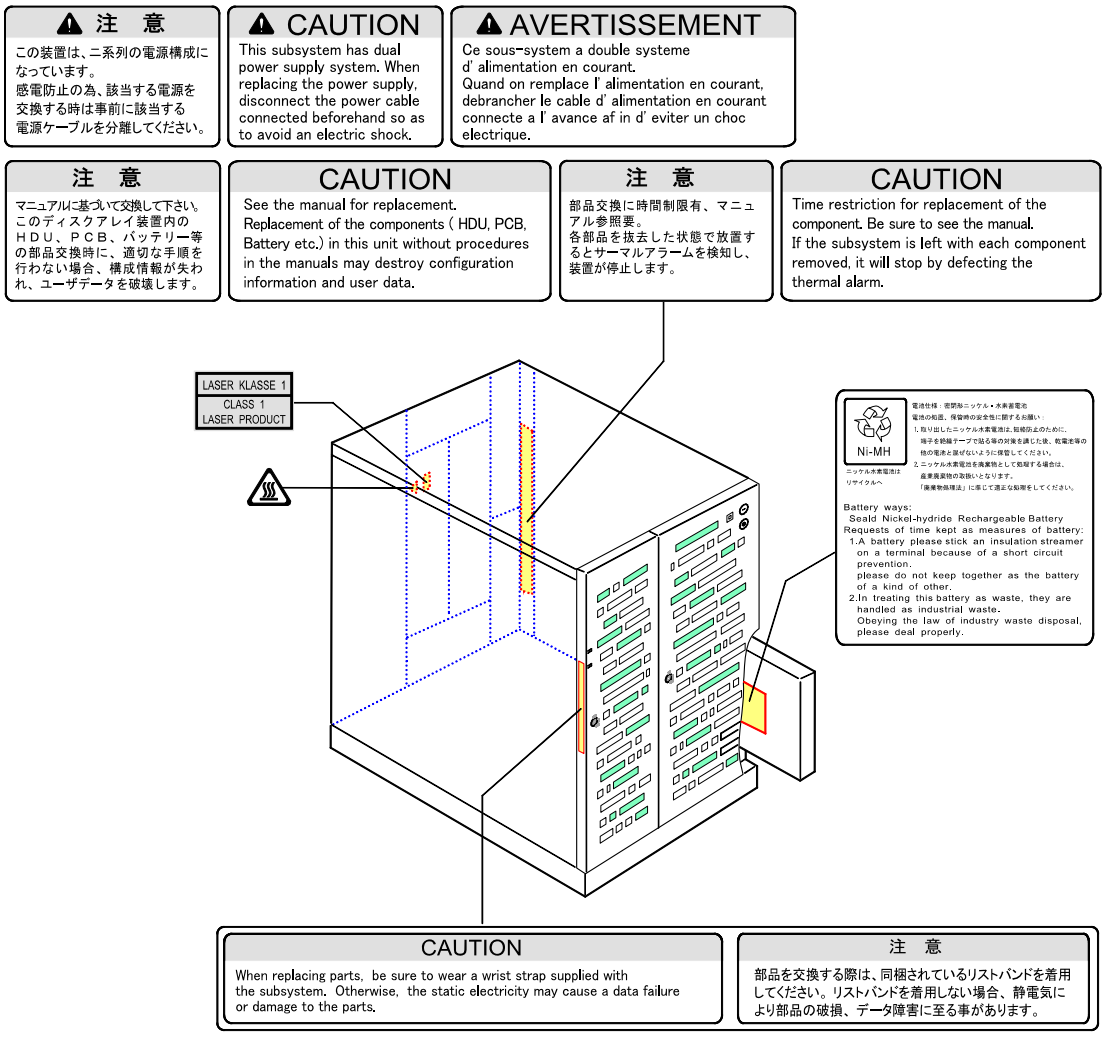

⚠ 注　意
この装置は、ニ系列の電源構成になっています。
感電防止の為、該当する電源を交換する時は事前に該当する電源ケーブルを分離してください。
⚠ CAUTION
This subsystem has dual power supply system. When replacing the power supply, disconnect the power cable connected beforehand so as to avoid an electric shock.
⚠ AVERTISSEMENT
Ce sous-system a double systeme d' alimentation en courant.
Quand on remplace l' alimentation en courant, debrancher le cable d' alimentation en courant connecte a l' avance af in d' eviter un choc electrique.
注　意
マニュアルに基づいて交換して下さい。
このディスクアレイ装置内のＨＤＵ、ＰＣＢ、バッテリー等の部品交換時に、適切な手順を行わない場合、構成情報が失われ、ユーザデータを破壊します。
CAUTION
See the manual for replacement.
Replacement of the components (HDU, PCB, Battery etc.) in this unit without procedures in the manuals may destroy configuration information and user data.
注　意
部品交換に時間制限有、マニュアル参照要。
各部品を抜去した状態で放置するとサーマルアラームを検知し、装置が停止します。
CAUTION
Time restriction for replacement of the component. Be sure to see the manual.
If the subsystem is left with each component removed, it will stop by defecting the thermal alarm.
LASER KLASSE 1
CLASS 1
LASER PRODUCT
Ni-MH
Battery ways:
Seald Nickel-hydride Rechargeable Battery
Requests of time kept as measures of battery:
1.A battery please stick an insulation streamer on a terminal because of a short circuit prevention.
please do not keep together as the battery of a kind of other.
2.In treating this battery as waste, they are handled as industrial waste.
Obeying the law of industry waste disposal, please deal properly.
CAUTION
When replacing parts, be sure to wear a wrist strap supplied with the subsystem. Otherwise, the static electricity may cause a data failure or damage to the parts.
注　意
部品を交換する際は、同梱されているリストバンドを着用してください。リストバンドを着用しない場合、静電気により部品の破損、データ障害に至る事があります。

Figure 2.2　Positions and Contents of Labels on Rack-Mount Model RKS+RKAJ+H2J

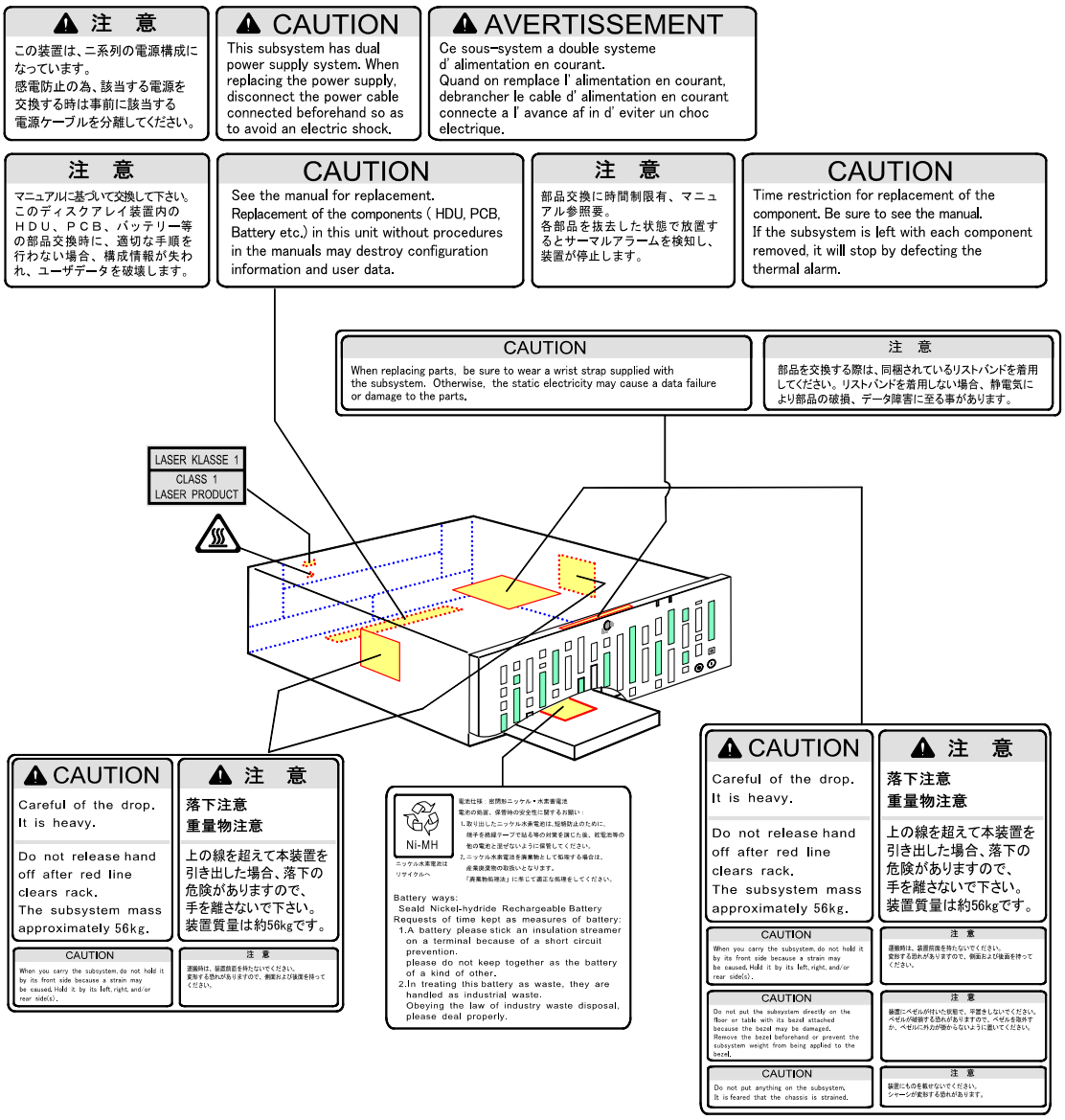

注　意
この装置は、ニ系列の電源構成になっています。
感電防止の為、該当する電源を交換する時は事前に該当する電源ケーブルを分離してください。
CAUTION
This subsystem has dual power supply system. When replacing the power supply, disconnect the power cable connected beforehand so as to avoid an electric shock.
AVERTISSEMENT
Ce sous-system a double systeme d' alimentation en courant.
Quand on remplace l' alimentation en courant, debrancher le cable d' alimentation en courant connecte a l' avance af in d' eviter un choc electrique.
注　意
マニュアルに基づいて交換して下さい。
このディスクアレイ装置内のＨＤＵ、ＰＣＢ、バッテリー等の部品交換時に、適切な手順を行わない場合、構成情報が失われ、ユーザデータを破壊します。
CAUTION
See the manual for replacement.
Replacement of the components (HDU, PCB, Battery etc.) in this unit without procedures in the manuals may destroy configuration information and user data.
注　意
部品交換に時間制限有、マニュアル参照要。
各部品を抜去した状態で放置するとサーマルアラームを検知し、装置が停止します。
CAUTION
Time restriction for replacement of the component. Be sure to see the manual.
If the subsystem is left with each component removed, it will stop by defecting the thermal alarm.
CAUTION
When replacing parts, be sure to wear a wrist strap supplied with the subsystem. Otherwise, the static electricity may cause a data failure or damage to the parts.
注　意
部品を交換する際は、同梱されているリストバンドを着用してください。リストバンドを着用しない場合、静電気により部品の破損、データ障害に至る事があります。
LASER KLASSE 1
CLASS 1
LASER PRODUCT
CAUTION
Careful of the drop.
It is heavy.
Do not release hand off after red line clears rack.
The subsystem mass approximately 56kg.
注　意
落下注意
重量物注意
上の線を超えて本装置を引き出した場合、落下の危険がありますので、手を離さないで下さい。
装置質量は約56kgです。
Ni-MH
Battery ways:
Seald Nickel-hydride Rechargeable Battery
Requests of time kept as measures of battery:
1.A battery please stick an insulation streamer on a terminal because of a short circuit prevention.
please do not keep together as the battery of a kind of other.
2.In treating this battery as waste, they are handled as industrial waste.
Obeying the law of industry waste disposal, please deal properly.

Figure 2.3 Positions and Contents of Labels on Rack-Mount Model RKS

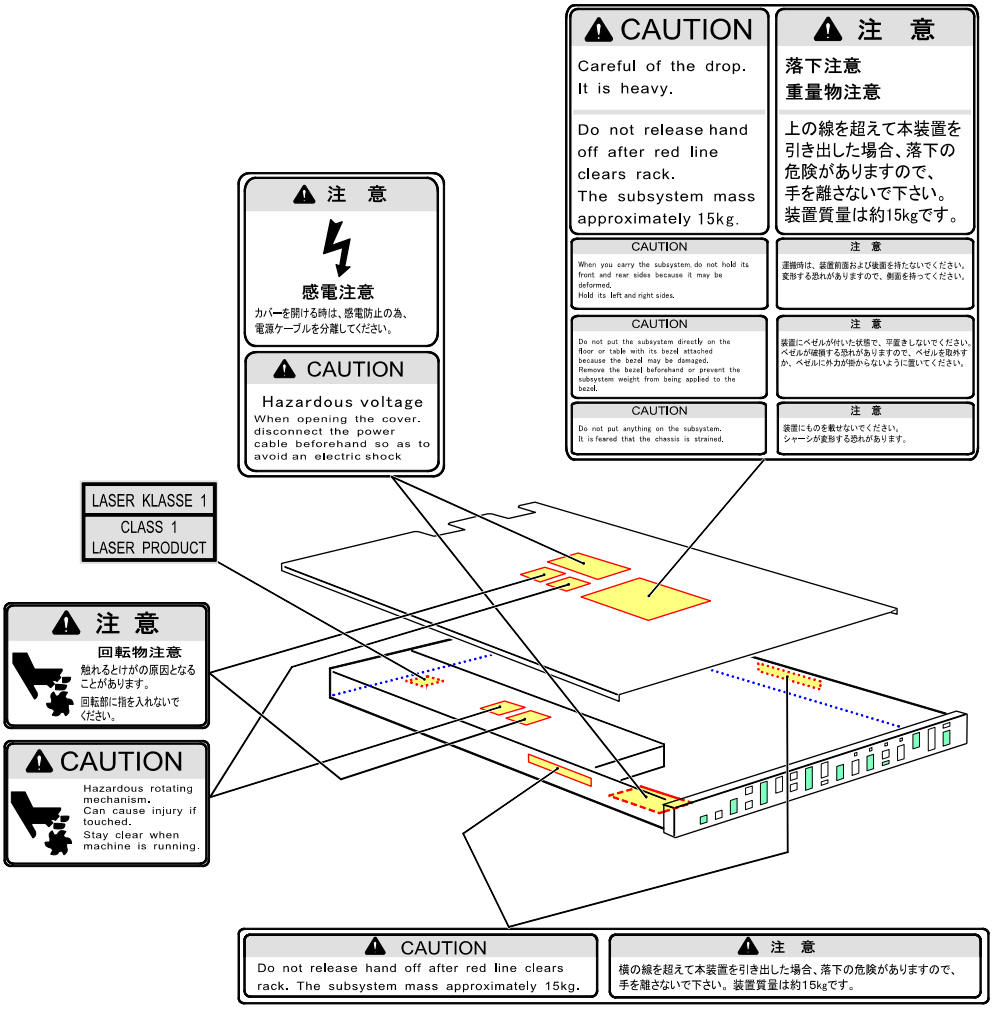

CAUTION
Careful of the drop.
It is heavy.
Do not release hand off after red line clears rack.
The subsystem mass approximately 15kg.
注 意
落下注意
重量物注意
上の線を超えて本装置を引き出した場合、落下の危険がありますので、手を離さないで下さい。
装置質量は約15kgです。
CAUTION
When you carry the subsystem, do not hold its front and rear sides because it may be deformed.
Hold its left and right sides.
注 意
運搬時は、装置前面および後面を持たないでください。変形する恐れがありますので、側面を持ってください。
CAUTION
Do not put the subsystem directly on the floor or table with its bezel attached because the bezel may be damaged.
Remove the bezel beforehand or prevent the subsystem weight from being applied to the bezel.
注 意
装置にベゼルが付いた状態で、平置きしないでください。ベゼルが破損する恐れがありますので、ベゼルを取外すか、ベゼルに外力が掛からないように置いてください。
CAUTION
Do not put anything on the subsystem.
It is feared that the chassis is strained.
注 意
装置にものを載せないでください。シャーシが変形する恐れがあります。
注 意
感電注意
カバーを開ける時は、感電防止の為、電源ケーブルを分離してください。
CAUTION
Hazardous voltage
When opening the cover, disconnect the power cable beforehand so as to avoid an electric shock
LASER KLASSE 1
CLASS 1
LASER PRODUCT
注 意
回転物注意
触れるとけがの原因となることがあります。
回転部に指を入れないでください。
CAUTION
Hazardous rotating mechanism.
Can cause injury if touched.
Stay clear when machine is running.
CAUTION
Do not release hand off after red line clears rack. The subsystem mass approximately 15kg.
注 意
横の線を超えて本装置を引き出した場合、落下の危険がありますので、手を離さないで下さい。装置質量は約15kgです。

Figure 2.4 Positions and Contents of Labels on Rack-Mount Model RKNAS

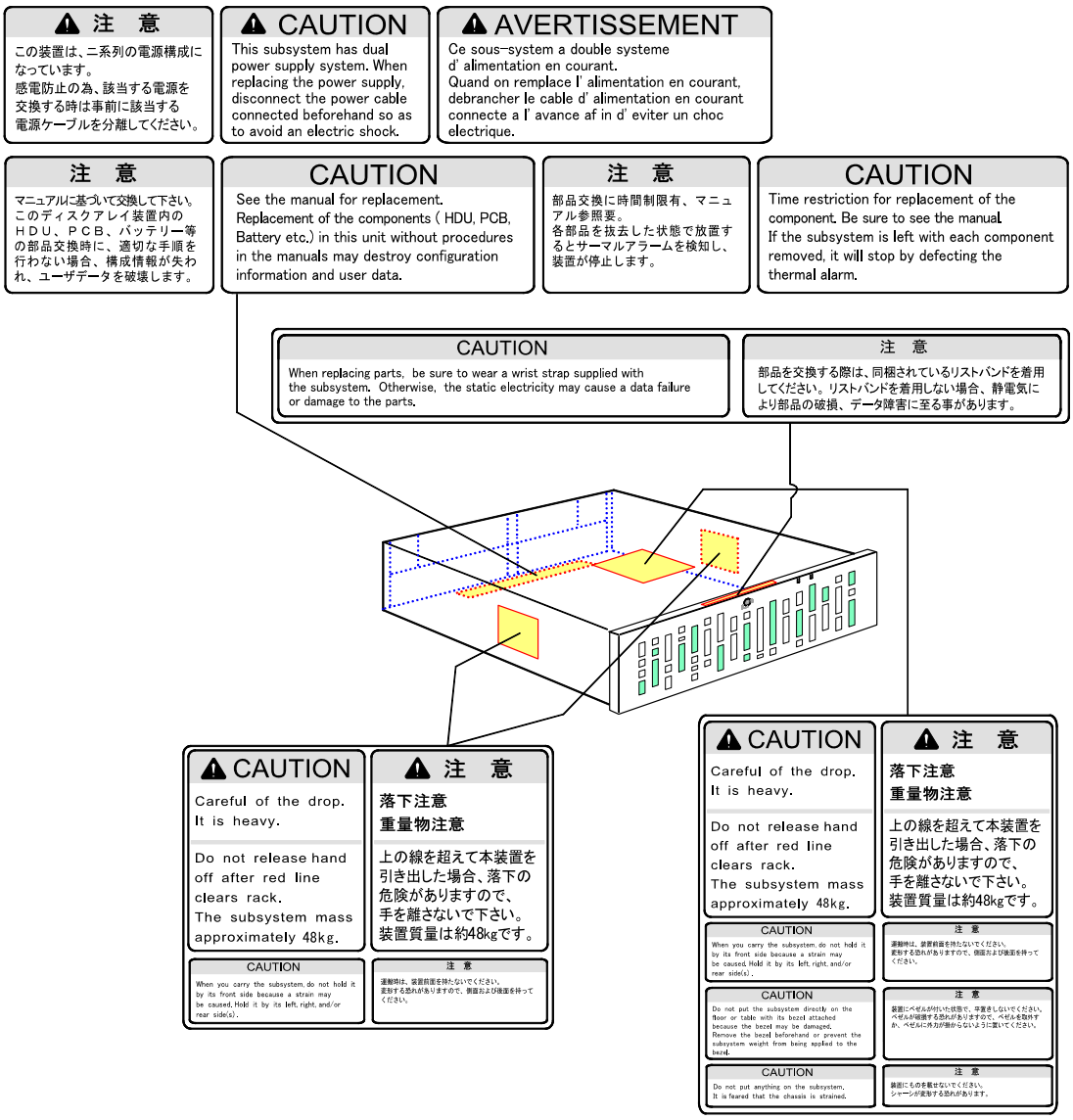

注　意
この装置は、ニ系列の電源構成になっています。
感電防止の為、該当する電源を交換する時は事前に該当する電源ケーブルを分離してください。
CAUTION
This subsystem has dual power supply system. When replacing the power supply, disconnect the power cable connected beforehand so as to avoid an electric shock.
AVERTISSEMENT
Ce sous-system a double systeme d' alimentation en courant.
Quand on remplace l' alimentation en courant, debrancher le cable d' alimentation en courant connecte a l' avance af in d' eviter un choc electrique.
注　意
マニュアルに基づいて交換して下さい。
このディスクアレイ装置内のＨＤＵ、ＰＣＢ、バッテリー等の部品交換時に、適切な手順を行わない場合、構成情報が失われ、ユーザデータを破壊します。
CAUTION
See the manual for replacement.
Replacement of the components (HDU, PCB, Battery etc.) in this unit without procedures in the manuals may destroy configuration information and user data.
注　意
部品交換に時間制限有、マニュアル参照要。
各部品を抜去した状態で放置するとサーマルアラームを検知し、装置が停止します。
CAUTION
Time restriction for replacement of the component. Be sure to see the manual
If the subsystem is left with each component removed, it will stop by defecting the thermal alarm.
CAUTION
When replacing parts, be sure to wear a wrist strap supplied with the subsystem. Otherwise, the static electricity may cause a data failure or damage to the parts.
注　意
部品を交換する際は、同梱されているリストバンドを着用してください。リストバンドを着用しない場合、静電気により部品の破損、データ障害に至る事があります。
CAUTION
Careful of the drop.
It is heavy.
Do not release hand off after red line clears rack.
The subsystem mass approximately 48kg.
注　意
落下注意
重量物注意
上の線を超えて本装置を引き出した場合、落下の危険がありますので、手を離さないで下さい。
装置質量は約48kgです。
CAUTION
When you carry the subsystem, do not hold it by its front side because a strain may be caused. Hold it by its left, right, and/or rear side(s).
注　意
運搬時は、装置前面を持たないでください。
変形する恐れがありますので、側面および後面を持ってください。
CAUTION
Do not put the subsystem directly on the floor or table with its bezel attached because the bezel may be damaged. Remove the bezel beforehand or prevent the subsystem weight from being applied to the bezel.
注　意
装置にベゼルが付いた状態で、平置きしないでください。
ベゼルが破損する恐れがありますので、ベゼルを取外すか、ベゼルに作力が掛からないように置いてください。
CAUTION
Do not put anything on the subsystem.
It is feared that the chassis is strained.
注　意
装置にものを載せないでください。
シャーシが変形する恐れがあります。

Figure 2.5 Positions and Contents of Labels on Rack-Mount Model RKAJ/RKAJAT

2.3 General Specifications and Requirements

This section describes the general specifications and requirements for the AMS200 subsystem. The following are included:

- Dimensions and weight
- Service clearance requirements
- Floor load rating
- Internal logic specifications
- Cable requirements

2.3.1 Dimensions and Weight

The following table illustrates the dimensions and weight of the AMS200 rack-mount model and the AMS200 floor model.

Table 2.3 AMS200 Dimensions and Weight of Rack-Mount Model

Item	Model	Rack-mount Model		
		RKS	RKAJ	RKAJAT
Physical Specifications	Chassis size (W×D×H) (mm)	483×650×174	483×650×129	
	Mass (kg)	56 approx	40 approx	
	Acoustic noise (dB)	57 approx	60 approx	
	Required height (EIA unit)	4	3	

Table 2.4 AMS200 Dimensions and Weight of Floor Model

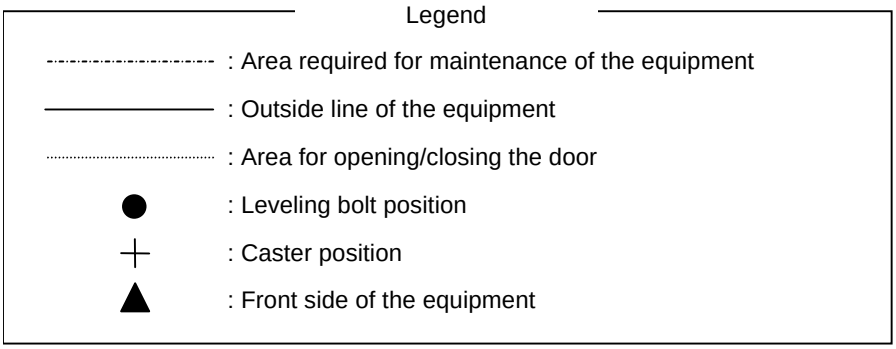
Item	Model	Floor Model	
		Floor (RKS+H1J) Model	Floor (RKS+RKAJ+H2J) Model
Physical Specifications	Chassis size (W×D×H) (mm)	260×737×540	260×737×540
	Mass (kg)	70 approx	115 approx
	Acoustic noise (dB)	56 approx	59 approx

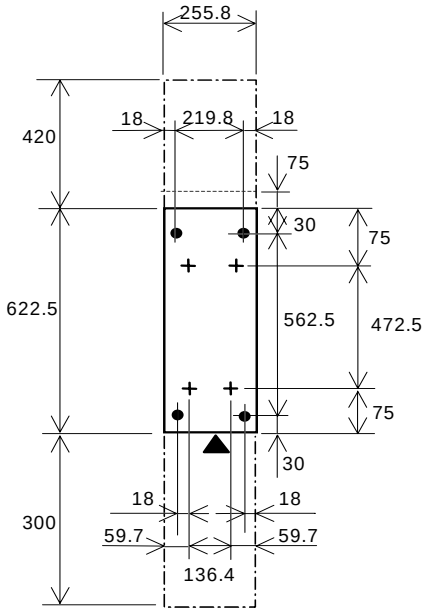
Table 2.5 AMS200 Dimensions and Weight of the NAS Unit

Item	Model	RKNAS
Physical Specifications	Chassis size (W×D×H) (mm)	483×650×43
	Mass (kg)	15 approx
	Acoustic noise (dB)	60 approx

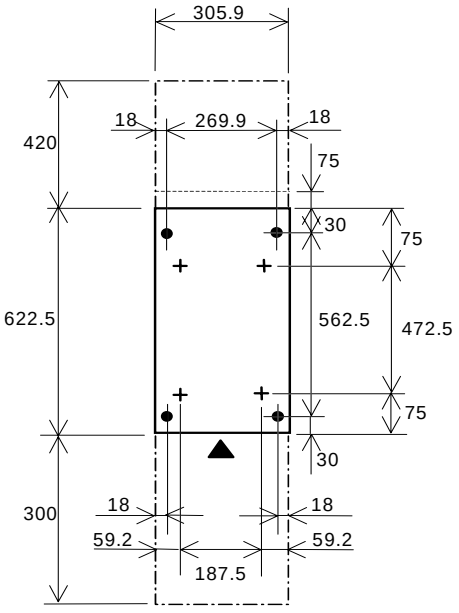
2.3.2 Service Clearance Requirements

The following figure shows the floor area required for installing the equipment. Install the equipment in a place with the area shown in the figure to avoid problems such as inadequate service clearance or insufficient ventilation. All distances in the following figure are stated in millimeters (mm).


Legend
: Area required for maintenance of the equipment
: Outside line of the equipment
: Area for opening/closing the door
: Leveling bolt position
: Caster position
: Front side of the equipment



Floor (RKS+H1J) Model



Floor (RKS+RKAJ+H2J) Model

2.3.3 Floor Load Rating

This section includes:

- Floor load rating for the AMS200 rack-mount model
- Floor load rating for the AMS200 floor model

2.3.3.1 Floor Load Rating for AMS200 Rack-Mount Model

In the maximum configuration, the rack-mount model can be configured with 1 RKS and 6 additional units (RKAJs/RKAJATs and RKNAS). The total weight of the subsystem in this configuration is 530 kg.

Note: For information about the global rack-mount model, refer to the *Acer | HDS Global 19-Inch Rack Reference Guide* (MK-93DF665).

2.3.3.2 Floor Load Rating for AMS200 Floor Model

The Floor (RKS+H1J) Model contains up to 2 controller boards and up to 15 disk drives. The maximum configuration weighs 70 kg. To ensure adequate load-bearing capacity, plan for the maximum configuration.

The Floor (RKS+RKAJ+H2J) Model contains up to 2 controller boards and up to 30 disk drives. The maximum configuration weights 115kg. To ensure adequate load-bearing capacity, plan for the maximum configuration.

2.3.4 Internal Logic Specifications

The following table lists the internal logic specifications of the AMS200.

Table 2.6 Internal Logic Specification of AMS200 Rack-Mount Model

Item		Specification	
		RKS	RKNAS
Internal logic specification	Control CPU	Power PC7447A (500 MHz)	Intel LV-Xeon 2.8GHz
	Control memory	Flash memory: 2 M bytes L2 cache memory: 512 k bytes SRAM: 64 M bytes	Bios: 1 M bytes L2 cache memory: 1M bytes
	Data assurance method	Data bus: Through-parity Cache memory: ECC (1 bit for correction, 2 bits for detection) Disk drive: Data assurance code	Data bus: Through-parity Cache memory: ECC (1 bit for correction, 2 bits for detection)

Notes:

- RKAJ/RKAJAT is not included in these specifications.
- For information about the global rack-mount model, refer to the *Acer | HDS AMS200 and WMS100 Global 19-Inch Rack Reference Guide*.

2.3.5 Cable Function

The following table lists the principal functions of the AMS200 and RKNAS cables. Fibre channel cables are available from Acer | HDS.

Table 2.7 Principal Functions of AMS200 Cables

Cable	Principal Use
Fibre Channel cable	Connect with a host or HBA/Switch.
LAN cable (Cross/Straight)	Connect the PCs for user, monitoring and maintenance. Connect with a host or a HAB for Ethernet. (When iSCSI interface and RKNAS are connected) Connect between RKS and RKNAS for maintenance management.
ENC (ENCLOSURE) cable	Connect between the subsystems with Fibre Channel (FC_AL).
NAS interface cable	Connect between RKS and RKNAS for NAS control. (When RKNAS is connected)

2.4 Environmental Specifications and Requirements

To maintain optimal AMS200 performance, the AMS200 subsystem must be installed in a proper environment. This section discusses the following necessary environmental specifications and requirements:

- Environmental hazards
- Temperature and humidity requirements
- Input power and insulation performance specifications
- Air flow requirements
- Vibration and shock tolerances
- Reliability

2.4.1 Environmental Hazards

Do not install the subsystem in the places described below; the life of equipment functioning will be shortened and equipment failures will occur. Avoid the following:

- Direct sunlight exposure
- Temperature and humidity variation (for example, near an air conditioner)
- Close proximity to a device that generates electrical noise and motion (for example, air conditioner that is not grounded and washing machine motor)
- Close proximity to an apparatus that generates a strong magnetic field
- Excessive dust
- Frequent vibrations
- An inclined floor

Note: Do not store or install the equipment in a high temperature environment of 40 degrees centigrade or more; battery life will be shortened.

2.4.2 Temperature and Humidity Requirements

Table 2.8 lists the temperature and humidity requirements for the AMS200 subsystem.

Table 2.8 Environmental Specifications

Item		Specification
Temperature	In operation (°C)	10 to 40
	In non-operation (°C)	-10 to 50
	In transport/storage (°C)	-30 to 60
	Temperature change rate (°C/h)	10 or less
Humidity	In operation (%)	8 to 80
	In non-operation (%)	8 to 90
	Maximum wet bulb temperature (°C)	29 (non-condensing)
Altitude	In operation (m)	-300 to 3,000
	In non-operation (m)	-300 to 12,000

2.4.3 Input Power and Insulation Performance Specifications

The following tables list the input power and insulation performance specifications for the AMS200 rack-mount models and the AMS200 floor model.

Conductors shall be provided with 30 A over current protection in accordance with Article 240 of the National Electrical Code, ANSI/NFPA 70, and the Canadian Electrical Code, Part 1, CSA C22.1, Section 14.

Table 2.9 Input Power and Insulation Performance Specifications for Rack-Mount Model

Item	Model		Rack-Mount Model		
			RKS	RKAJ	RKAJAT
Input power specification	Input voltage (V)		AC 100/200 (100-120/200-240)		
	Frequency (Hz)		50/60 ± 1		
	Number of phases, cabling		Single-phase with protective grounding		
	Steady-state current (A) (*Note1*) (*Note2*)		4.0×2/2.0×2	2.6×2/1.3×2	2.4×2/1.2×2
	Breaking current (A)		16.0	10.0	
	Required power	Steady state (VA)	800 or less	520 or less	480 or less
		Starting state (VA)	800 or less	560 or less	480 or less
	Heat value (kJ/h)		2,880 or less	1,875 or less	1,730 or less
Insulation	Insulation withstand voltage		AC 1,500 V (10 mA, 1 min)		
performance	Insulation resistance		DC 500 V, 10 MΩ or more		

Note 1: Power current of Nx2 described above is required for operation by a single power supply unit.

Note 2: It indicates the current consumption in the usual state. When a power supply failure occurs, the power consumption is provided by the single power supply for the subsystem.

Table 2.10 Input Power and Insulation Performance Specifications for the Floor Model

Item	Model		Floor Model	
			Floor (RKS+H1J) Model	Floor (RKS+RKAJ+H2J) Model
Input power specification	Input voltage (V)		AC 100/200 (100-120/200-240)	
	Frequency (Hz)		50/60 ± 1	
	Number of phases, cabling		Single-phase with protective grounding	
	Steady-state current (A) (*Note 1*) (*Note 2)*		4.0×2/2.0×2	4.0×2+2.6×2/2.0×2+1.3×2
	Breaking current (A)		16.0	
	Required power	Steady state (VA)	800 or less	1,320 or less
		Starting state (VA)	800 or less	1,360 or less
	Heat value (kJ/h)		2,880 or less	4,755 or less
Insulation	Insulation withstand voltage		AC 1,500 V (10 mA, 1 min)	
performance	Insulation resistance		DC 500 V, 10 M Ω or more	
Note1: Power current of Nx2 described above is required for operation by a single power supply unit. *Note2:* The current value in the operation by a single power supply unit is same as that in the operation by both power supply units.				

Table 2.11 Input Power and Insulation Performance Specifications for the NAS Unit

Item	Model		RKNAS
Input power specification	Input voltage (V)		AC 100/200 (100-120/200-240)
	Frequency (Hz)		50/60 ± 1
	Number of phases, cabling		Single-phase with protective grounding
	Steady-state current (A)		2.0/1.4
	Breaking current (A)		10.0
	Required power	Steady state (VA)	280 or less
		Starting state (VA)	280 or less
Heat value (kJ/h)			1,010 or less
Insulation performance	Insulation withstand voltage		AC 1,500 V (10 mA, 1 min)
	Insulation resistance		DC 500 V, 10 M Ω or more

2.4.4 Air Flow Requirements

The AMS200 subsystem is air-cooled. Air must enter the subsystem through the airflow intakes at the front of each subsystem and must be exhausted out of the back.

2.4.5 Vibration and Shock Tolerances

Table 2.12 lists the vibration and shock tolerance data for the AMS200 subsystem. The AMS200 can tolerate vibration and shock within these limits and continue to perform normally. The user should consider these requirements if installing the AMS200 near large generators located on the floor above or below the AMS200 subsystem. Generators or any other source of vibration, if not insulated or shock-mounted, can cause excessive vibration that may affect the subsystem.

Table 2.12 Vibration and Shock Tolerances

Item		Specification
Vibration	In operation (m/s^2)	2.5 or less
	In non-operation (m/s^2)	5.0 or less
	In transport (packed) (m/s^2)	5.0 or less
Impact	In operation (m/s^2)	20 or less
	In non-operation (m/s^2)	50 or less
	In transport (packed) (m/s^2)	80 or less
Angle at which the subsystem will turn over (°)		15 or less

2.4.6 Reliability

The reliability of the AMS200 is described in the following tables.

The following reliability does not change even when the RKNAS is connected to the system.

Table 2.13 Reliability of AMS200 Rack-Mount Model (RKS/RKAJ)

Item	Model	Rack-Mount Model	
		RKS	RKAJ
Reliability	MTBDL (Mean Time Between Data Lost) (*Note*)	About 20 million hour or longer (in RAID 5 configuration) RAID 6 configuration $\frac{(\text{MTBF of the disk drive})^3}{n(n-1)(n-2)\times\text{Number of Parity group}\times\text{MTTR}^2}$ RAID 5 configuration: $\frac{(\text{MTBF of the disk drive})^2}{n(n-1)\times\text{Number of Parity group}\times\text{MTTR}}$ RAID 0 configuration $\frac{\text{MTBF of the disk drive}}{n\times\text{Number of Parity group}}$ RAID 1 or RAID1+0 configuration $\frac{(\text{MTBF of the disk drive})^2}{n\times 1\times\text{Number of Parity group}\times\text{MTTR}}$ MTTR: Mean Time To Repair n: Number of the mounted disk drive/Parity group	
	Drop in package (JIS Z 0200-1997)	No abnormality must be caused by a free drop of level IV.	
	Radio frequency radiation		
	Instantaneous power failure	10 ms (100% dip)	

Note: The value of the MTBDL is calculated in the following configuration: RAID 5:68 sp ((15D+1P)(4group+4(spare)). This value varies on user's system configuration.

Table 2.14 Reliability of AMS200 Rack-Mount Model (RKS/RKAJAT)

Item	Model	Rack-Mount Model	
		RKS	RKAJAT
Reliability	MTBDL (Mean Time Between Data Lost) (*Note*)	About 20 million hour or longer (in RAID5 configuration) RAID 6 configuration: $\frac{(\text{MTBF of the disk drive})^2}{n(n-1)\times\text{Number of Parity group}\times\text{MTTR}}$ RAID 1 or RAID1+0 configuration $\frac{(\text{MTBF of the disk drive})^2}{n\times 1\times\text{Number of Parity group}\times\text{MTTR}}$ MTTR: Mean Time To Repair n: Number of the mounted disk drive/Parity group	
	Drop in package (JIS Z 0200-1997)	No abnormality must be caused by a free drop of level IV.	
	Radio frequency radiation	Conforms to FCC Class A	
	Instantaneous power failure	10 ms (100% dip)	

Note: The value of the MTBDL is calculated in the following configuration: RAID 5:68 sp ((15D+1P)(4group+4(spare)). This value varies on user's system configuration.

Table 2.15 Reliability of AMS200 Floor Model

Item	Model	Floor Model	
		Floor (RKS+H1J) Model	Floor (RKS+RKAJ+H2J) Model
Reliability	MTBDL (Mean Time Between Data Lost) (*Note*)	About 5 million hour or longer (in RAID 5 configuration) RAID 6 configuration: $\frac{(\text{MTBF of the disk drive})^3}{n(n-1)(n-2)\times\text{Number of Parity group}\times\text{MTTR}^2}$ RAID 5 configuration: $\frac{(\text{MTBF of the disk drive})^2}{n(n-1)\times\text{Number of Parity group}\times\text{MTTR}}$ RAID0 configuration $\frac{\text{MTBF of the disk drive}}{n\times\text{Number of Parity group}}$ RAID1, RAID1+0 configuration $\frac{(\text{MTBF of the disk drive})^2}{n\times 1\times\text{Number of Parity group}\times\text{MTTR}}$ MTTR: Mean Time To Repair n: Number of the mounted disk drive/Parity group	
	Drop in package (JIS Z 0200-1997)	No abnormality must be caused by a free drop of level IV.	
	Radio frequency radiation	Conforms to FCC Class A	
	Instantaneous power failure	10 ms (100% dip)	

Note: The value of the MTBDL is calculated in the following configuration: RAID 5:68 sp ((15D+1P)(4group+4(spare)). This value varies on user's system configuration.

Table 2.16 Reliability of AMS200 Floor Model

Item	Model	Floor Model	
		Floor (RKS+H1J) Model	Floor (RKS+RKAJ+H2J) Model
Reliability	MTBDL (Mean Time Between Data Lost) (*Note*)	About 5 million hour or longer (in RAID 5 configuration) RAID 6 configuration: $\frac{(\text{MTBF of the disk drive})^3}{n(n-1)(n-2)\times\text{Number of Parity group}\times\text{MTTR}^2}$ RAID 5 configuration: $\frac{(\text{MTBF of the disk drive})^2}{n(n-1)\times\text{Number of Parity group}\times\text{MTTR}}$ RAID0 configuration $\frac{\text{MTBF of the disk drive}}{n\times\text{Number of Parity group}}$ RAID1, RAID1+0 configuration $\frac{(\text{MTBF of the disk drive})^2}{n\times 1\times\text{Number of Parity group}\times\text{MTTR}}$ MTTR: Mean Time To Repair n: Number of the mounted disk drive/Parity group	
	Drop in package (JIS Z 0200-1997)	No abnormality must be caused by a free drop of level IV.	
	Radio frequency radiation	Conforms to FCC Class A	
	Instantaneous power failure	10 ms (100% dip)	

Note: The value of the MTBDL is calculated in the following configuration: RAID 5:68 sp ((15D+1P)(4group+4(spare)). This value varies on user's system configuration.

Chapter 3 Powering On/Off Procedure

The disk drive may emit audible mechanical sounds when the disk drive is started (spun up), immediately after the subsystem is powered on and powered off (spun down). However, this does not indicate a problem if the WARNING or ALARM LED of the basic frame is off; you may use the subsystem.

This section describes power on/off procedures for the following:

- AMS200 Rack-Mount Model
- AMS200 Floor Model

This chapter provides the information on the Fibre, NAS, and iSCSI models. The following table illustrates the sections that provide the explanation for each model. According to the customer 's model, please read the required section.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
3.1	3.1.1 Subsystem Power On	○	○	○
	3.1.2 Subsystem Power Off	○	○	○
	3.1.3 Stop/Start/Restart of the NAS OS	–	○	–
3.2	3.2.1 Subsystem Power On	○	—	○
	3.2.2 Subsystem Power Off	○	—	○

○: The explanation is provided.
—: The explanation is not provided.

If the array subsystem connected to the NAS Unit is restarted, the cluster between the NAS Units stops. When the array subsystem is unavoidably restarted, execute it after stopping the cluster between the NAS Units and stopping the NAS OS of both NAS Units. Start the cluster between the NAS Units again after completing the restart for the array subsystem.

3.1 AMS200 Rack-Mount Model

The following steps describe power on/off procedures for the AMS200 rack-mount model.

Note: For information about the global rack-mount model, refer to the *Acer | HDS AMS200 and WMS100 Global Global 19-Inch Rack Reference Guide*.

3.1.1 Subsystem Power On

Note: The EALM lamp (red) of the controller (on the rear side of the subsystem) may come on between subsystem power-on and Ready status. However, it is not a problem if the EALM lamp (red) goes out during this period of time.

To power on the subsystem:

1. Verify that the main switch is turned off.
2. Verify that the AC power unit switch of each power unit is turned off.
3. Verify that the circuit breaker (CB1) is turned off.
4. When the RKNAS is mounted on the rack, verify that the AC Power Unit Switch of the power unit on the RKNAS is turned off.
5. Turn on the circuit breaker (CB1) of the PDB.
6. Turn on the AC Power Unit Switch of the power unit on RKNAS.
7. Turn on the AC power unit switch of the power unit on RKAJ/RKAJAT.

Note: When two or more disk drives are not installed on the additional disk drive unit side, shut off the power to the RKAJ/RKAJAT power unit.

8. Turn on the AC power unit switch of the power unit on RKS.
9. Turn on the main switch.
10. Make sure that the READY LED (green) on the RKS lights within five minutes. When the RKNAS is connected to the AMS200, make sure that the READY LED (green) on the RKNAS lights another three minutes later.If the READY LED (green) on the RKS blinks at a high pace, it blinks for up to 15 minutes because the download of the ENC/SENC firmware is executed. Even when the READY LED (green) blinks, the subsystem is operational. If the ALARM LED (red) or WARNING LED (orange) lights, refer to section 8.1.

Note 1: The EALM lamp (red) of the control unit (on the rear side of the subsystem) may come on between the powering on of the subsystem and entry into the Ready status of the RKS.
However, it is not a problem if the EALM lamp (red) goes out until the subsystem enters the Ready status.

Note 2: **A** NAS system cannot be accessed from a host computer even though the READY LED of NAS unit illuminates. A NAS system accepts access from a host computer only when of "ACTIVE" NAS OS Condition.

3.1.2 Subsystem Power Off

To power off the subsystem:

1. Turn off the main switch.
2. Verify that the POWER LED (green) on the panel of the RKS is off.
3. Turn off the AC power unit switch of the power unit.
4. When the RKNAS is mounted on the rack, turn off the AC Power Unit Switch of the power unit on RKNAS.
5. Turn off the circuit breaker (CB1) of the PDB.

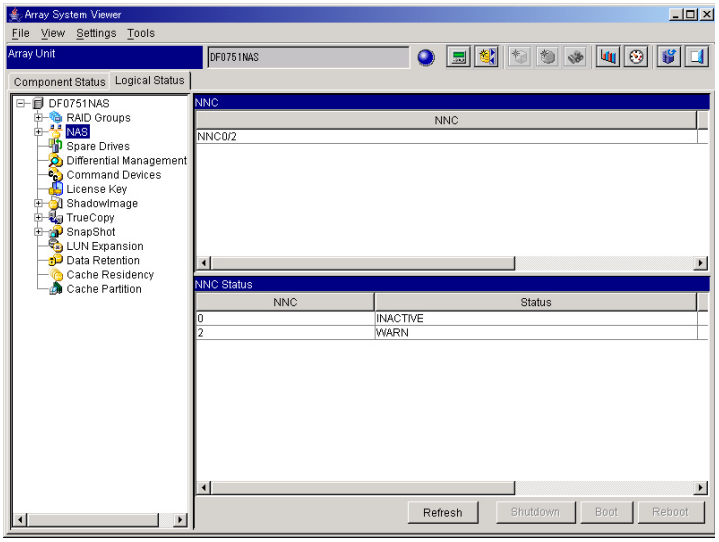
   Note: When storing the subsystem without turning on the power for long periods, request that the Customer Engineer turn off the battery of the subsystem. For details on how to store the subsystem, refer to Chapter 9.

3.1.3 Subsystem Power Off

Stop/Start/Restart of the NAS OS and NNC (NAS unit) status display is performed using Storage Navigator Modular.

To power off the subsystem:

1. Click the **Logical Status** tab on the Unit screen.
2. Click the **NAS**.



- NNC Status: It displays the status of NAS OS.

○: Operation enabled - : Operation disabled

Image	Status	Stop	Start	Restart
NEW	The NAS OS is not installed.	-	-	-
INST	The NAS OS is in installation process.	-	-	-
ACTIVE	The NAS OS is in operation and the Node is in operation.	○	○	○
STOP	The NAS OS is normally stopped	-	○	○
DOWN	The NAS OS is abnormally stopped	-	○	○
BOOT	The NAS OS is in start process.	○	-	○
SHUTDOWN	The NAS OS is in stop process.	-	○	○
INACTIVE	The NAS OS is in operation and the Node is stopped.	○	○	○
DUMP	A NAS Dump is being collected.	○	○	○
HUNGUP	The NAS OS is hung-up.	-	○	○
WARN	The NAS Manager is not installed, or the NAS OS is in operation and the status of the Node is unknown.	○	○	○
DISUSE	The Control Unit is blocked, so the NAS OS of the NNC concerned cannot be used. (Note)	-	-	-

Note: It is necessary to recover the blocked status of the Control Unit connected to the NAS Unit on the side where "DISUSE" is displayed.

- Button

Button Name	Operation
Shutdown	Put the NAS OS into the stop status.
Boot	Start the NAS OS.
Reboot	Restart the NAS OS which is in the stop status. The operation is not different from the "Boot" button.
Refresh	Update the display information to the latest information.

- *Note:* When starting the NAS OS, do not specify anything for the Boot Option.

3.2 AMS200 Floor Model

The following steps describe power on/off procedures for the AMS200 floor model.

3.2.1 Subsystem Power On

Note: The EALM lamp (red) of the controller (on the rear side of the subsystem) may come on between subsystem power-on and Ready status. However, it is not a problem if the EALM lamp (red) goes out during this period of time.

To power on the subsystem:

1. Verify that the main switch is turned off.
2. Verify that the AC power unit switch of the power unit is turned off.
3. Turn on the AC Power Unit Switch of the power unit on RKAJ/RKAJAT.

Note: When two or more disk drives are not installed on the additional disk drive unit side, shut off the power to the power unit (RKAJ).

4. Turn on the AC Power Unit Switch of the power unit on RKS.
5. Turn on the main switch.
6. Verify that the READY LED (green) lights within five minutes. If the READY LED (green) blinks rapidly, the ENC firmware is downloaded. Even when the READY LED (green) blinks, the subsystem is operational. If the ALARM LED (red) or WARNING LED (orange) lights, refer to section 8.1.

Note: The EALM lamp (red) of the control unit (on the rear side of the subsystem) may come on between subsystem power-up and entry into the Ready status. However, it is not a problem if the EALM lamp (red) goes out until the subsystem enters the Ready status.

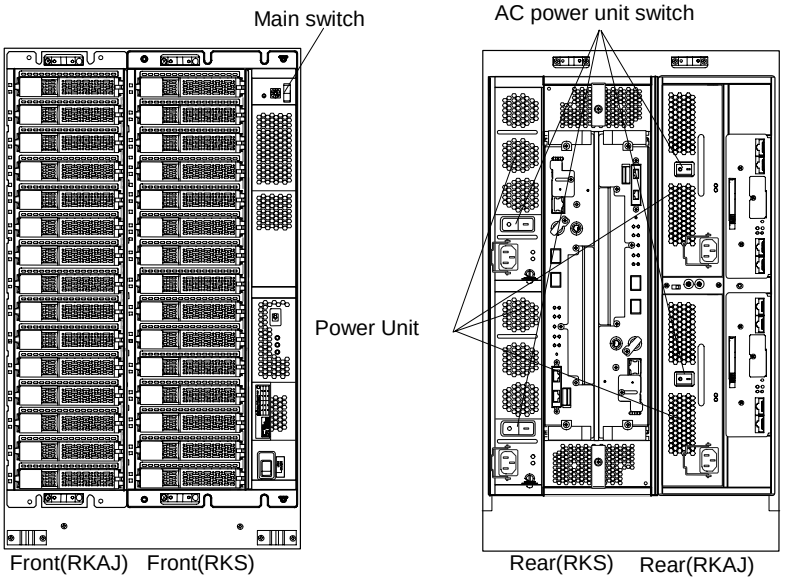


Figure 3.1 Subsystem Power On/Off (Example: Floor [RKS+ RKAJ+H2J)

3.2.2 Subsystem Power Off

To power off the subsystem:

1. Turn off the main switch.
2. Verify that the POWER LED (green) on the panel is off.
3. Turn off the AC power unit switch of the power unit.

Note: When storing the subsystem without turning on the power for long periods, request that the Customer Engineer turn off the battery of the subsystem. For details on how to store the subsystem, refer to Chapter 9.

Chapter 4 Subsystem Architecture and Components

This chapter includes the following:

- Configuration Block Diagrams
- Redundant Power Supplies
- Fibre Channel Interface
- NAS Interface
- iSCSI Interface
- Array Frames
- Component Names, Locations, and Functions

This chapter provides information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide an explanation for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
4.1	4.1.1 AMS 200 Rack-Mount Model	○	○	○
	4.1.2 AMS200 Floor Model	○	–	○
4.2	Redundant Power Supplies	○	○	○
4.3	Fibre Channel Interface	○	–	–
4.4	NAS Interface	–	○	–
4.5	iSCSI Interface	–	–	○
4.6	4.6.1 AMS200 Rack-Mount Model	○	○	○
	4.6.2 Floor Model	○	–	○
4.7	4.7.1 Front Bezel Component Locations and Functions	○	○	○
	4.7.2 Component Locations	○	○	○
	4.7.3 Switch Locations and Functions	○	○	○
	4.7.4 Connector Locations and Functions	○	○	○
	4.7.5 LED Locations and Functions	○	○	○

○: The explanation is provided.
—: The explanation is not provided.

4.1 Configuration Block Diagrams

This section includes block diagrams for the following:

- AMS200 rack-mount model
- AMS200 floor model

4.1.1 AMS200 Rack-Mount Model

The configuration block diagrams of the Rack-Mount models are shown below. The RKS/RKAJ/RKAJAT can mount up to 15 disk drives. (The RKS has a controller that can controller that can control up to 105 disk drives as RAID.) The disk drives can be assigned to data disk(s), parity disk(s) (mirror disk(s)) depending on the RAID level. Up to 15 spare disks can be mounted in any location within the configuration.

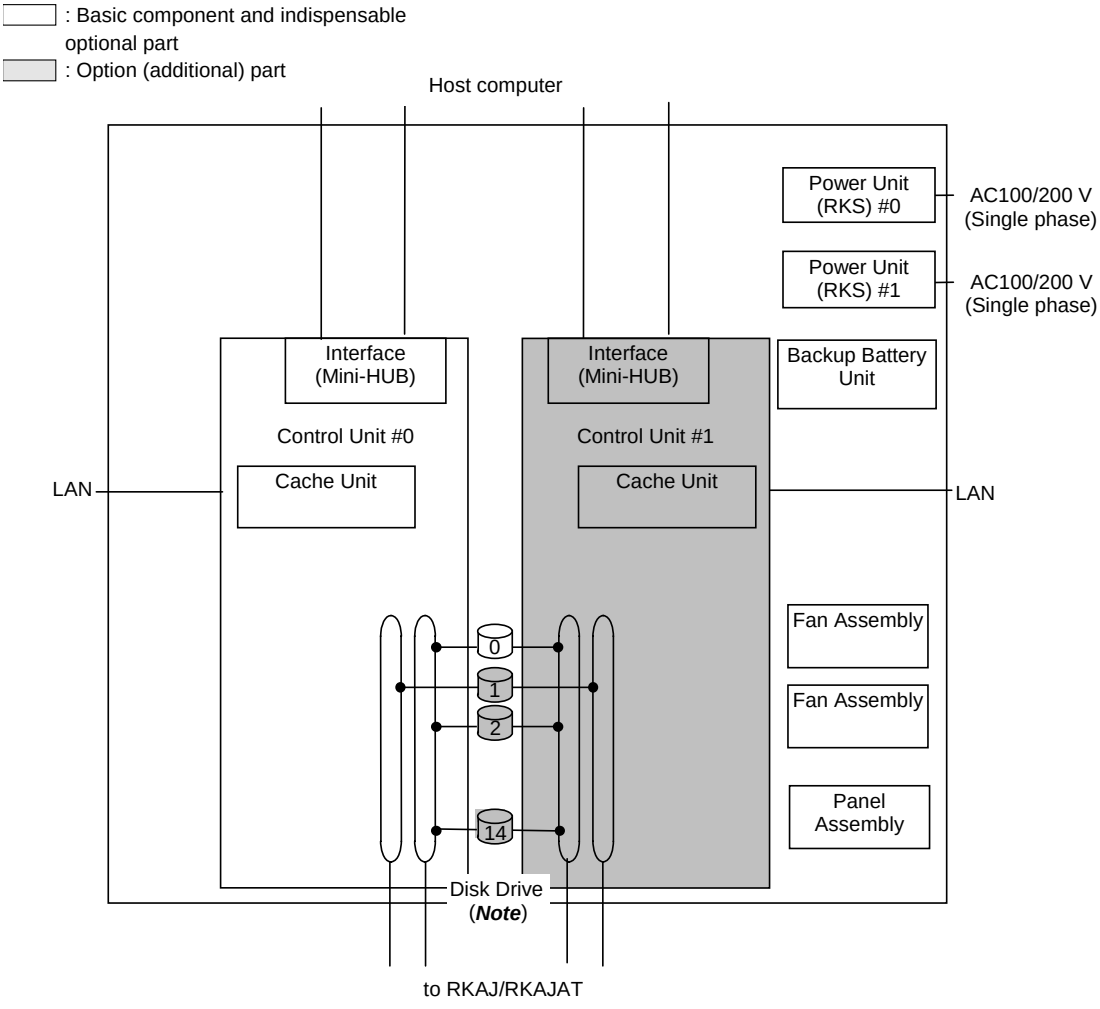


Figure 4.1 RKS System Configuration (When Interface board is not added)

Note: Disk drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300.

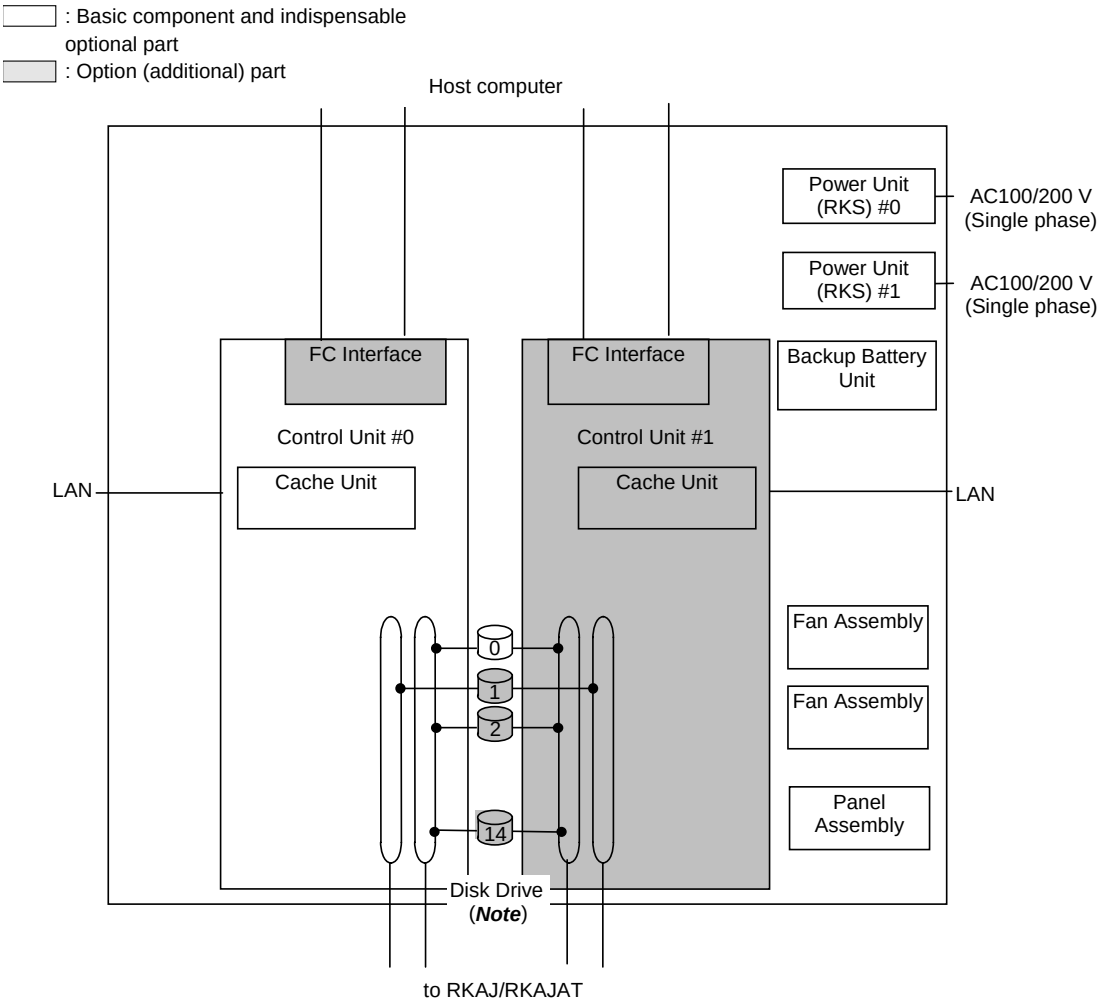


Figure 4.2 RKS System Configuration (When FC Interface board is added)

Note: Disk drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300.

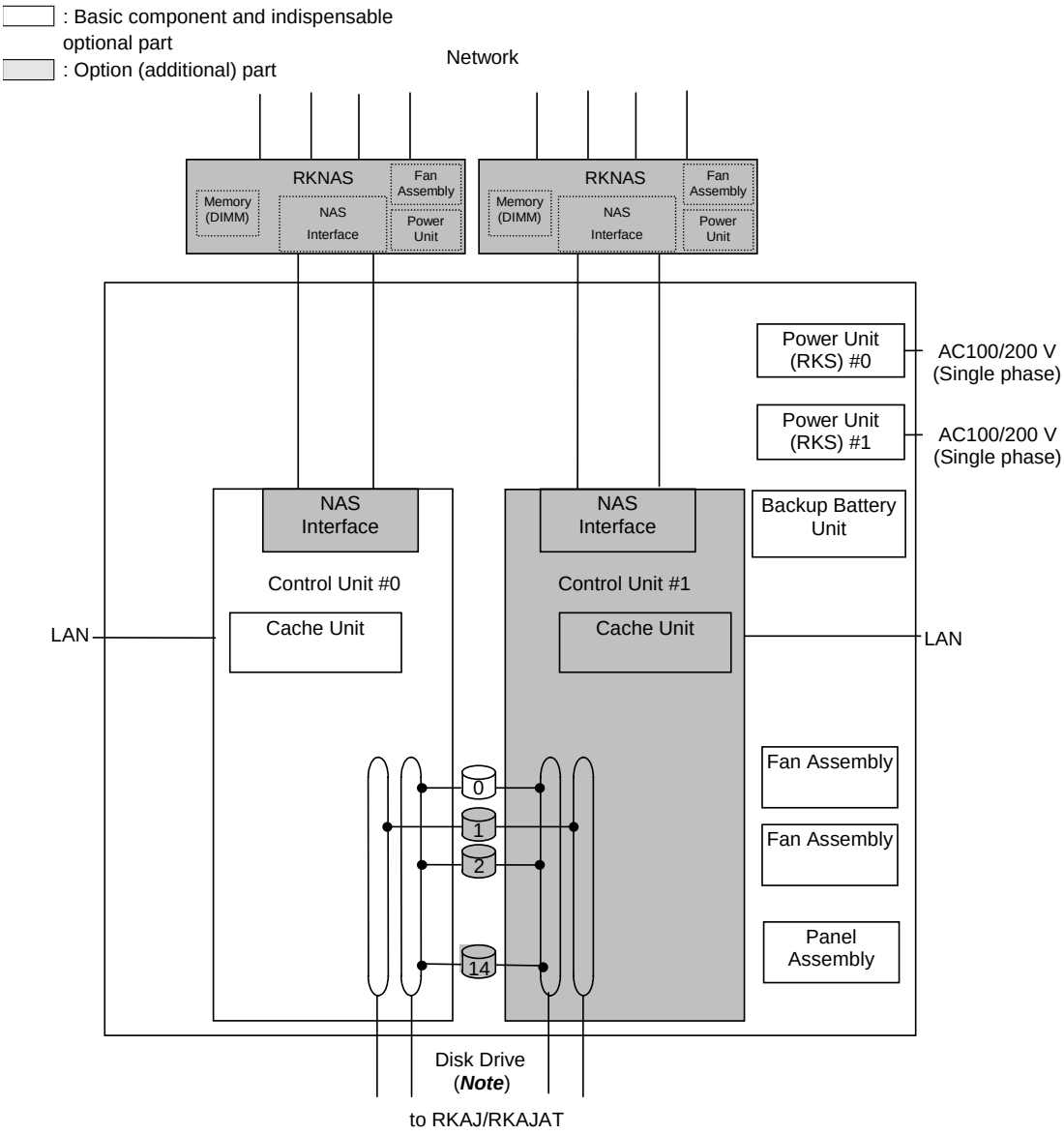


Figure 4.3 RKS System Configuration (when the iSCSI Interface board is added)

Note: Disk drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300.

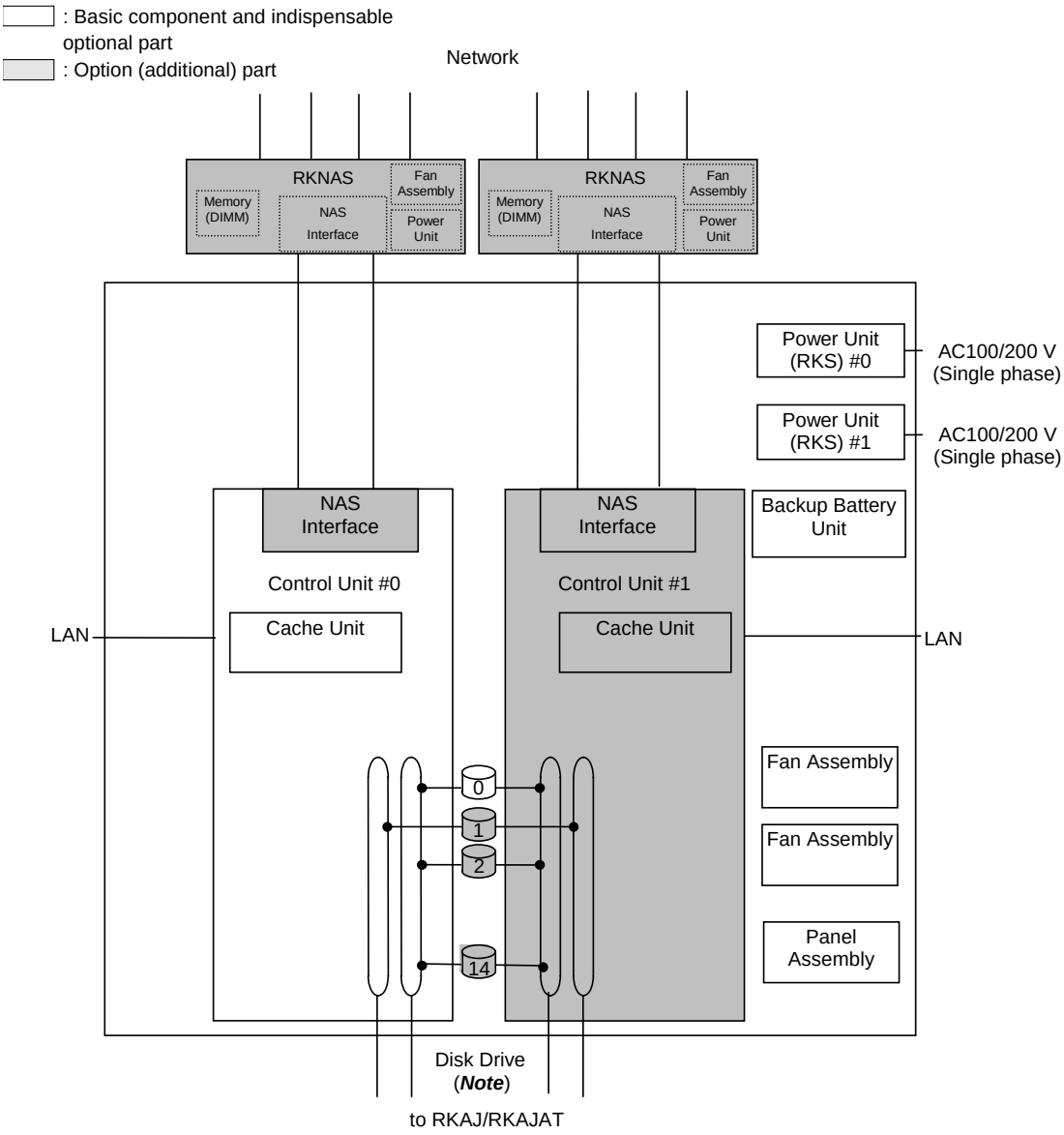


Figure 4.4 RKS and RKNAS System Configuration

Note: Disk drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300.

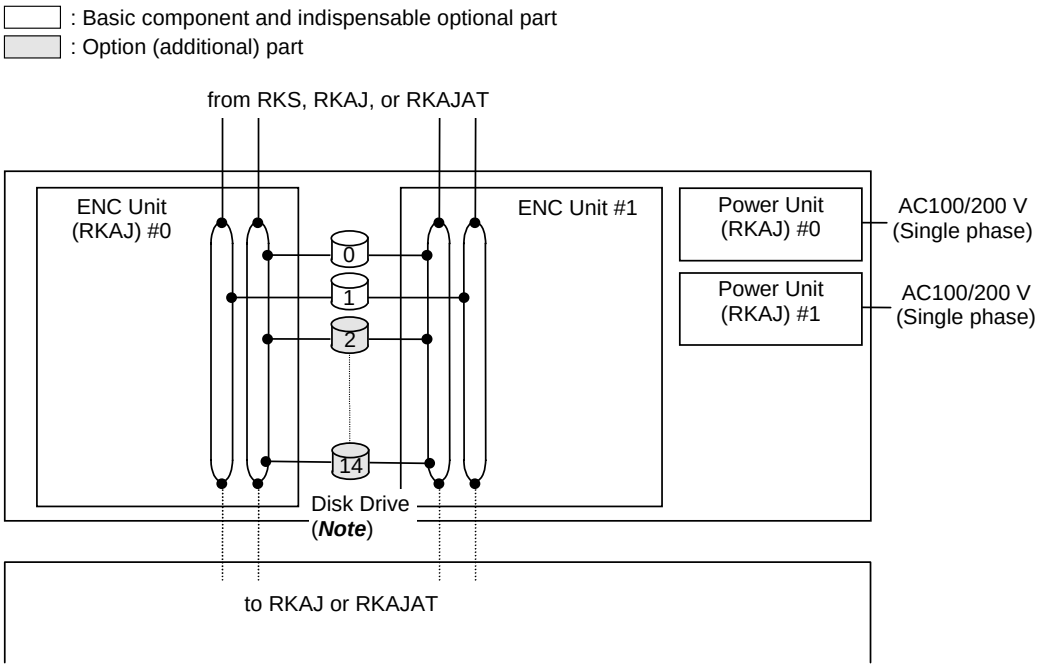


Figure 4.5 RKAJ System Configuration

Note: Disk drive: Disk drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300.

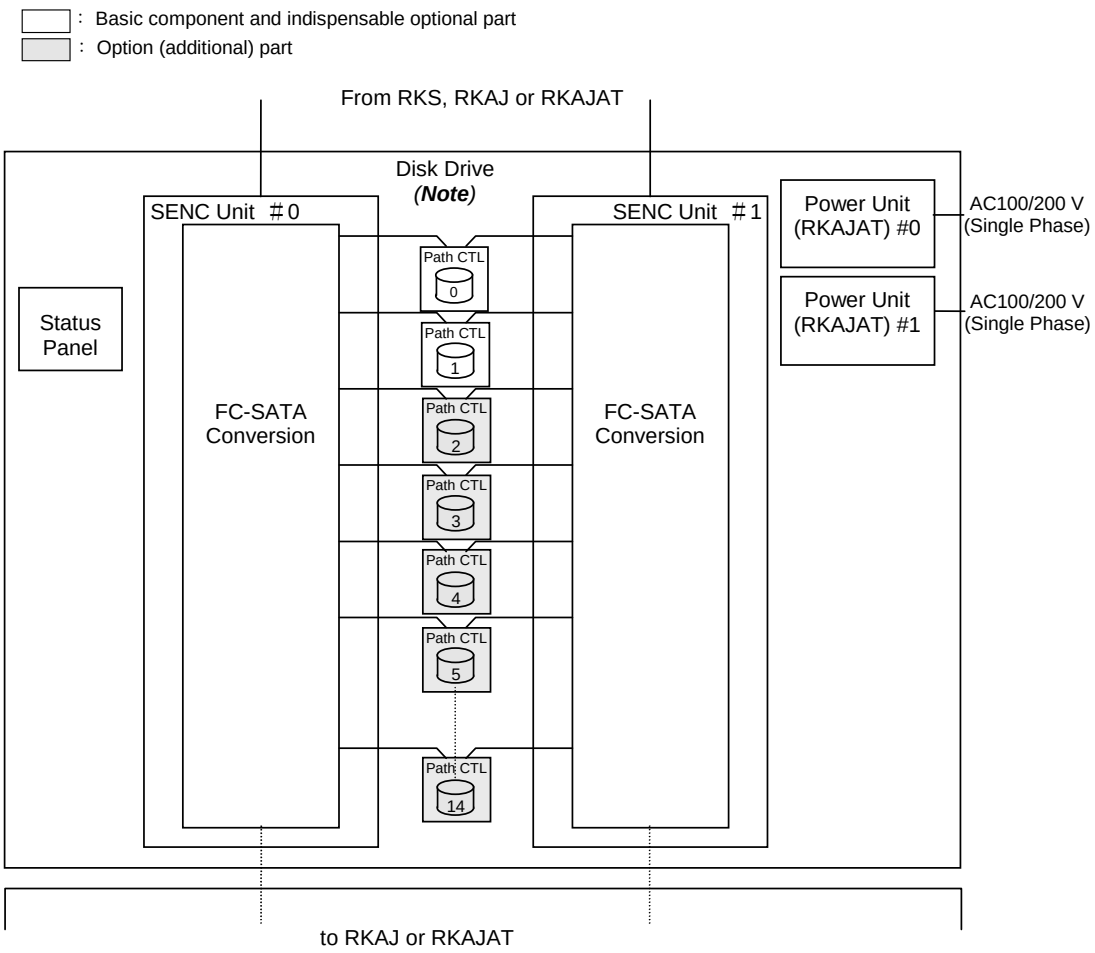


Figure 4.6 RKAJAT System Configuration

Note: Disk drive: DF-F700-ATE250R and DF-F700-ATE400R.

4.1.2 AMS200 Floor Model

The configuration block diagrams of the Floor Models are shown below.

The Floor (RKS+H1J) Model accommodates up to 15 disk drives. The Floor (RKS+RKAJ+H2J) Model accommodates up to 30 disk drives. The disk drives can be assigned to data disk(s), parity disk(s) and (mirror disk(s)) depending on the RAID level.

Up to 15 spare disks (Floor [RKS+H1J] Model: up to 1) can be mounted in any locations within the configuration.

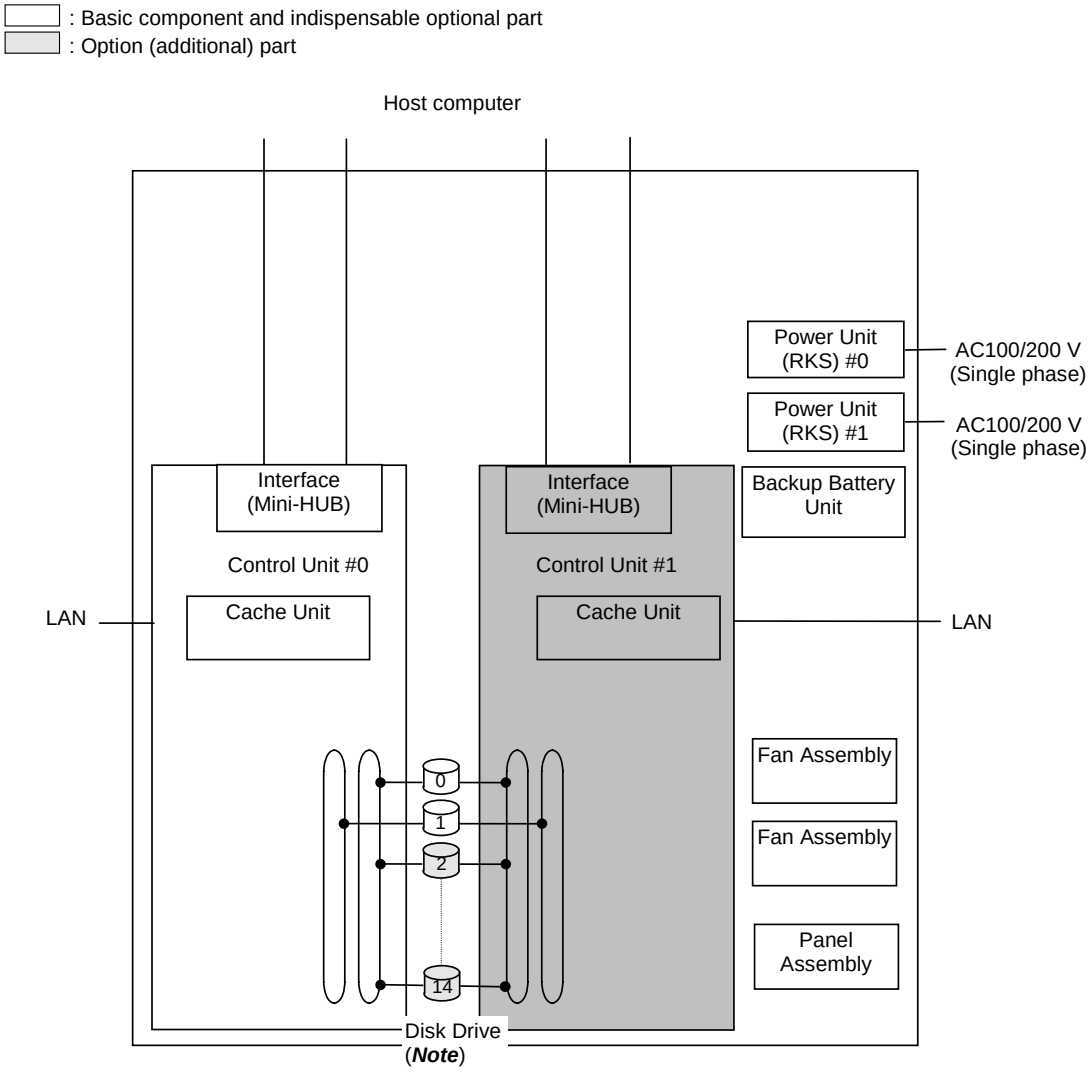


Figure 4.7 Floor (RKS+H1J) Model AMS200 System Configuration (When FC Interface board is not added)

Note: Disk Drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300.

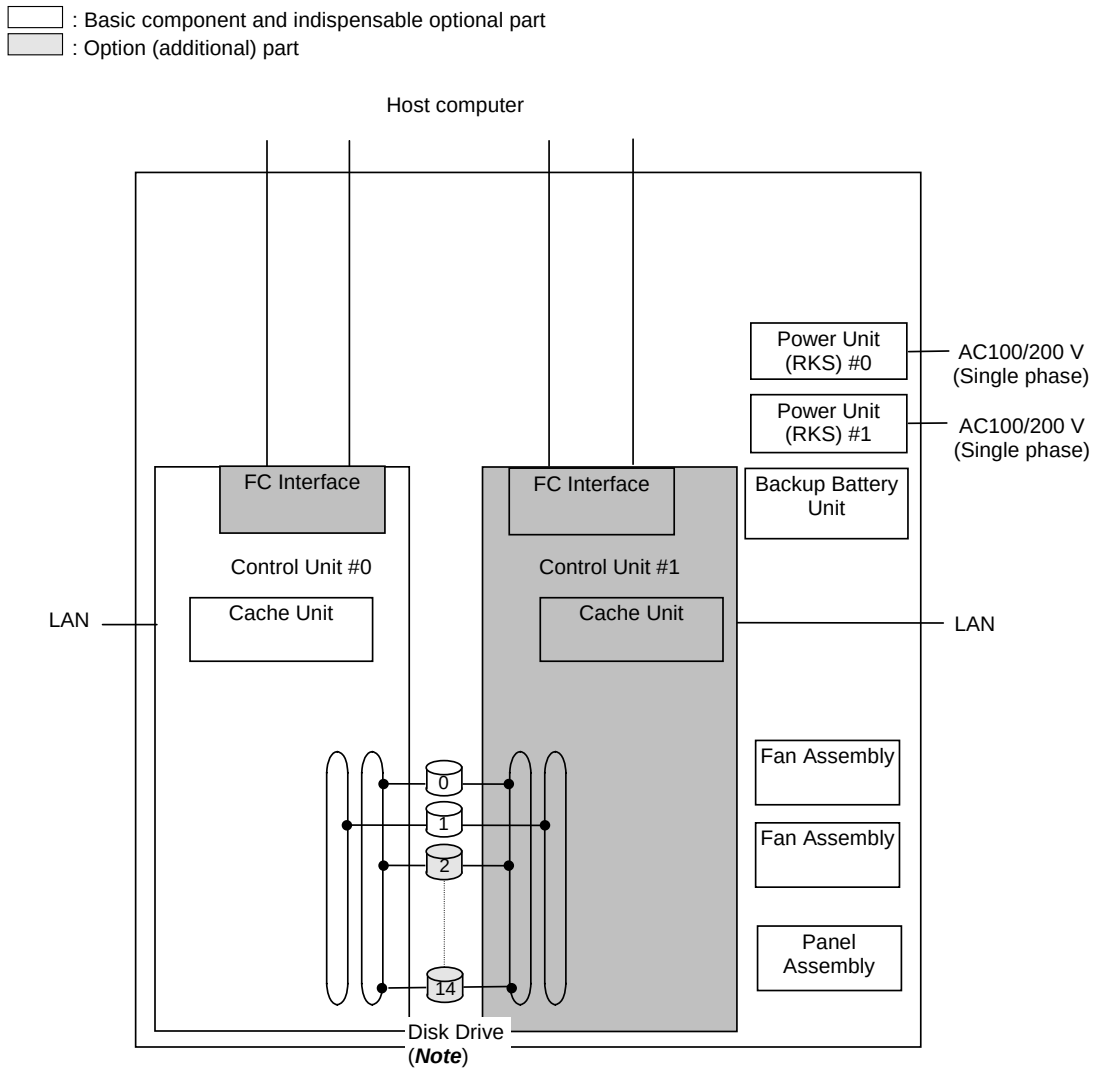


Figure 4.8 Floor (RKS+H1J) Model AMS200 System Configuration (When FC Interface board is added)

Note: Disk Drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300.

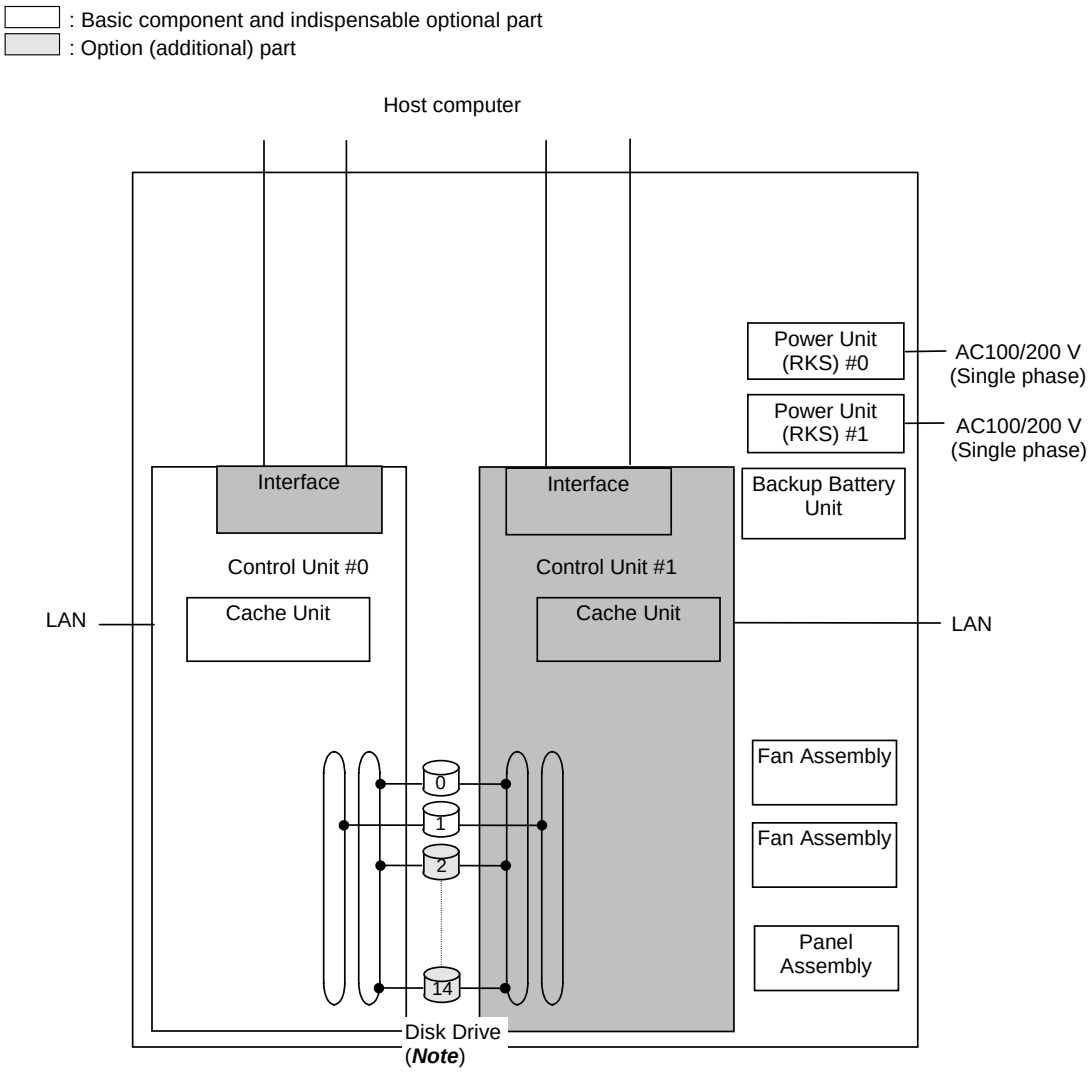


Figure 4.9 Floor (RKS+H1J) Model AMS200 System Configuration (When iSCSI Interface board is added)

Note: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300

: Basic component and indispensable optional part
: Option (additional) part

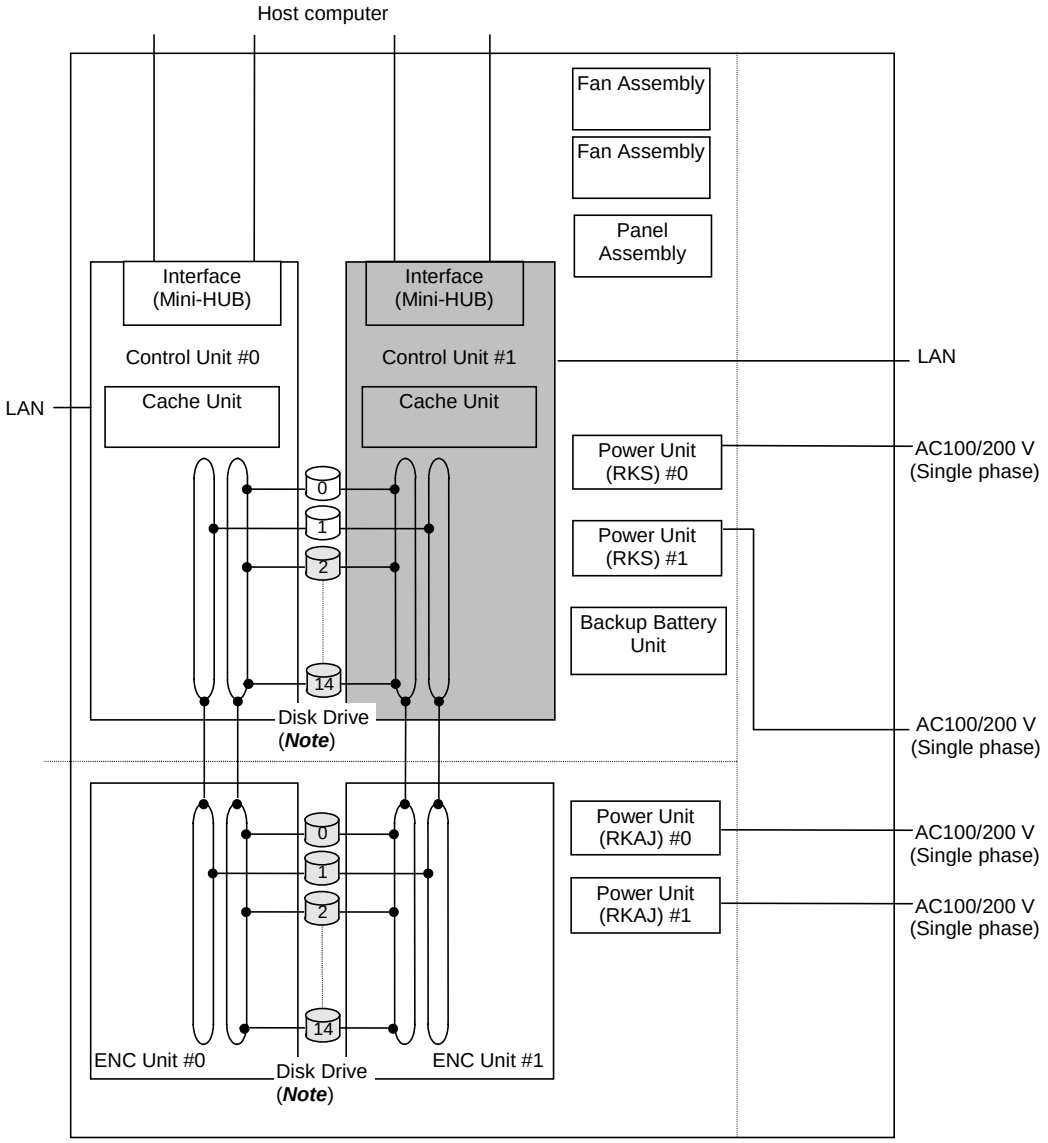


Figure 4.10 Floor (RKS+RKAJ+H2J) Model AMS200 System Configuration (When Interface board is not added)

Note: Disk Drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300

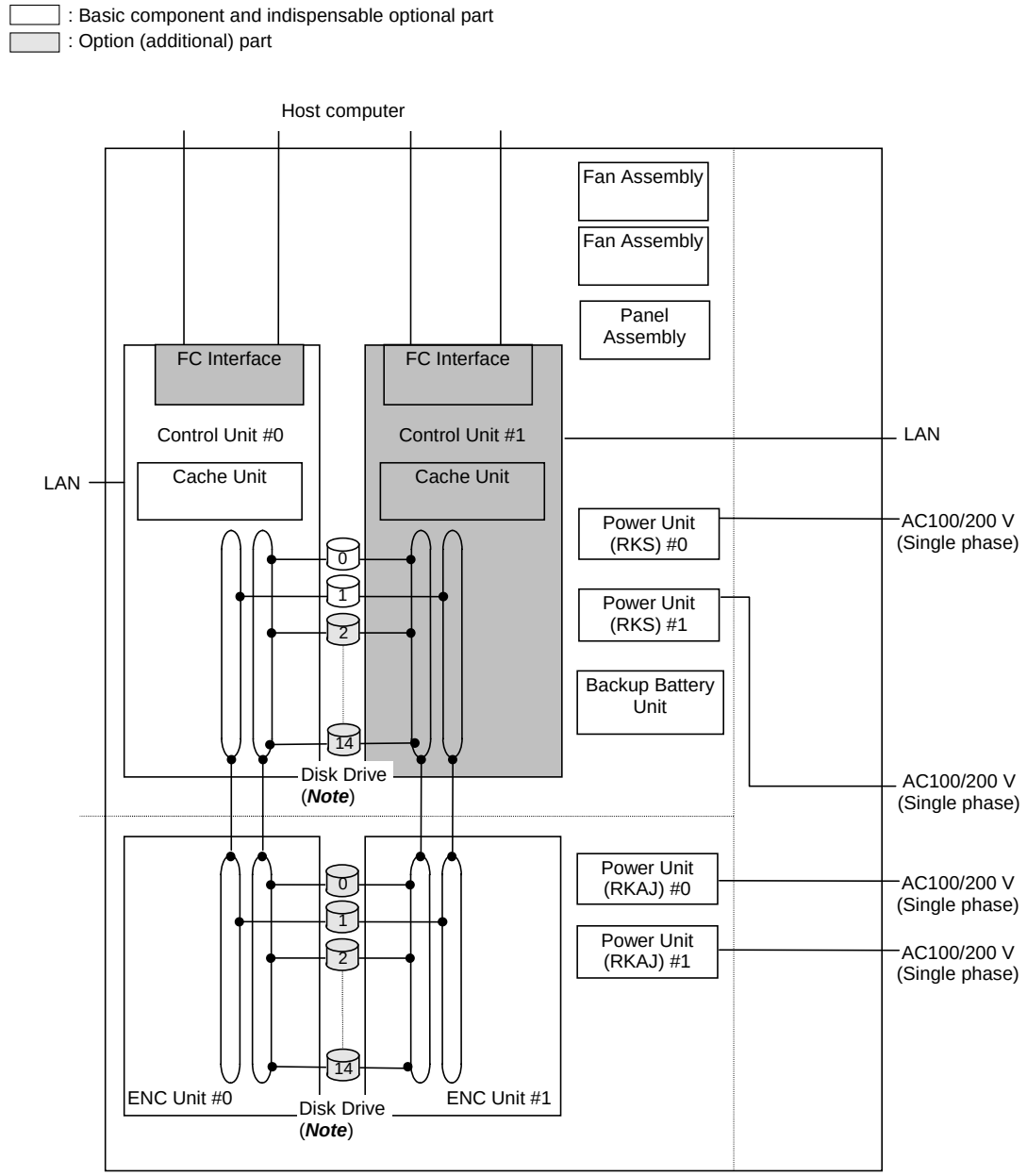


Figure 4.11 Floor (RKS+RKAJ+H2J) Model AMS200 System Configuration (When FC Interface board is added)

Note: Disk Drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300

: Basic component and indispensable optional part
: Option (additional) part

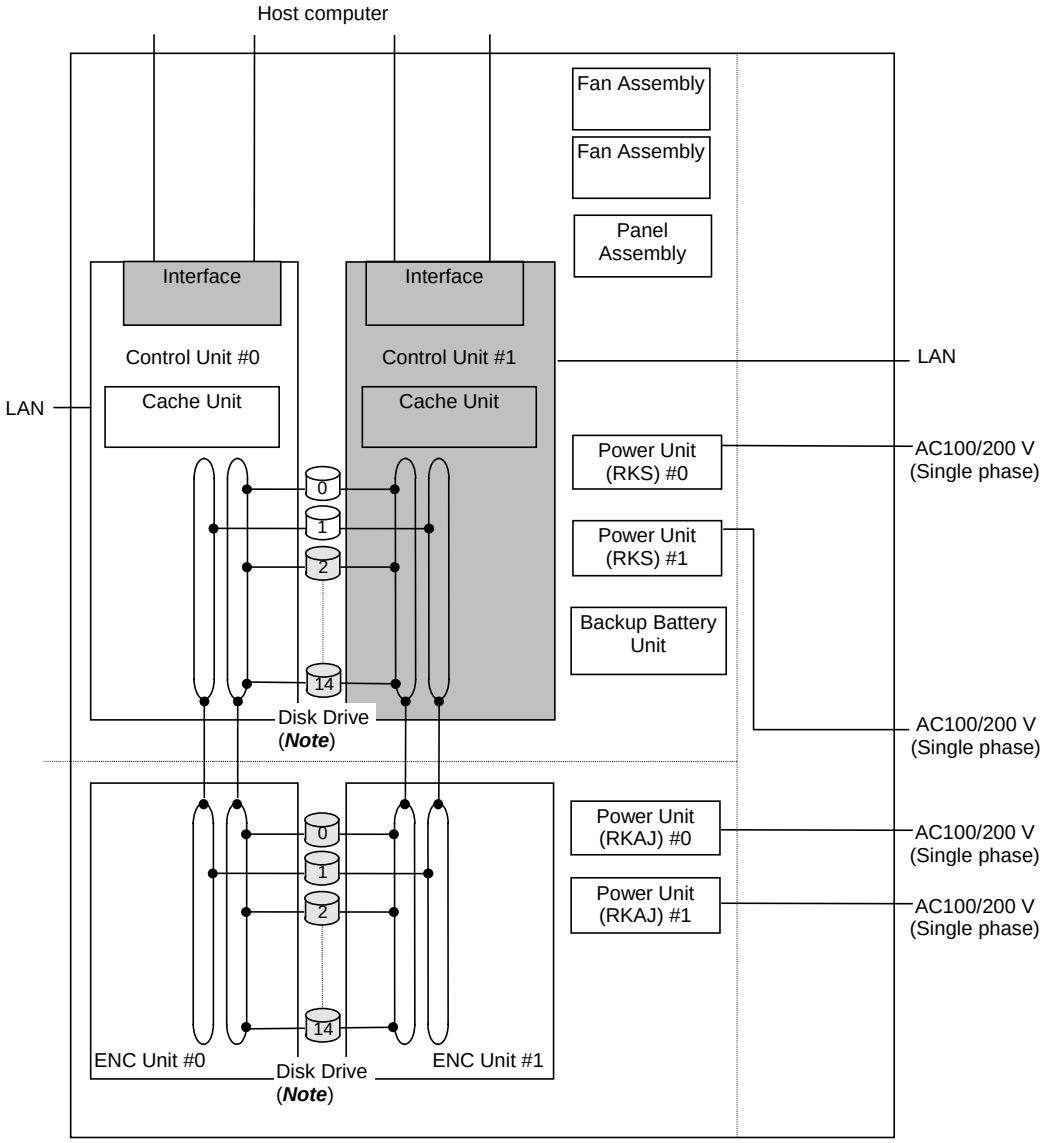


Figure 4.12 Floor (RKS+RKAJ+H2J) Model AMS200 System Configuration (When iSCSI Interface board is added)

Note: Disk Drive: DF-F700-AGF72, DF-F700-AGH72, DF-F700-AGF146, DF-F700-AGH146, DF-F700-AGF300

4.2 Redundant Power Supplies

Each AMS200 unit is powered by its own set of redundant power supplies, and each power supply is able to provide power for the entire RKS unit, should it become necessary. Because of this redundancy, the AMS200 subsystem can sustain the loss of a power supply and still continue operation. To make use of this capability, the two power supplies of each AMS200 unit should be connected either to dual power sources or to different power panels, so if there is a power failure on one of the sources, the AMS200 subsystem can continue full operations using power from the alternate source.

RKNAS has no redundancy of power supplies.

4.3 Fibre Channel Interface

The AMS200 subsystem supports open system operations. The AMS200 subsystem supports up to 2 fibre-channel ports. Each AMS200 Fibre Channel interface is capable of operating at data transfer speeds of up to 200 MB/sec. The AMS200 extends up to 4 Fibre Channel ports by adding optional an FC interface board. The AMS200 supports shortwave multimode optical cables. With these shortwave fibre channel cables, the AMS200 subsystem can be located up to 300 meters from the open-system host.

4.3.1 Mini-HUB

When the FC interface board is not added to the control unit, the host interface of the AMS200 has a Mini-HUB in the control unit, and enhances one port to two host connectors. However, the link status between the host and AMS200 is recognized as one port.

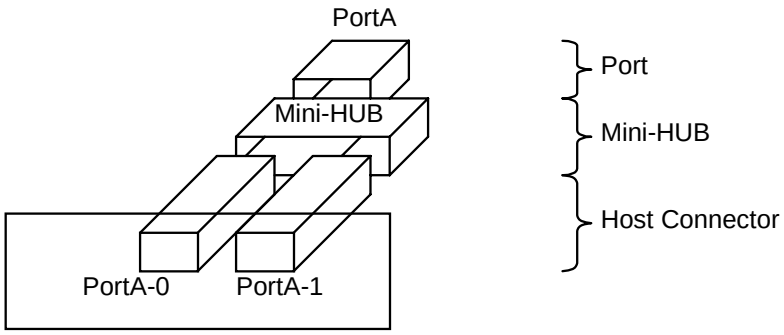


Figure 4.13 AMS200 FC Connector

4.3.2 Connection Specifications

4.3.2.1 When the FC Interface Board is Not Added

The host connector that can be used varies, depending on the topology setting of the AMS200 and the destination of the Fibre Channel cable connection. The following table shows available host connector of each topology setting and connection method.

Table 4.1 Available Host Connectors of Each Topology Setting and Connection /Method

No.	AMS200 Topologies	AMS200 Transfer Rate	Direct Connection to the Host	Switch Connection	Direct Connection to TagmaStore USP (see *Note*) Direct Connection to 9900V
1	Loop	Auto	Host Connector 0	Not Supported	Host Connector #0
		1 Gbps/2 Gbps	Host Connector 0 and 1		
2	Point-to-Point	Auto/1 Gbps/2 Gbps	Not Supported	Host Connector #0	Not Supported

Note: TagmaStore USP is an abbreviation for TagmaStore Universal Storage Platform, and it is a higher-level model in the TagmaStore series.

When connecting the AMS200 directly to the host, the Loop topology is set to the port:

- Connect the AMS200 to the host connector 0, when the transfer rate of AMS200 is Auto. (Do not connect anything to the host connector 1.)
- Both host connectors 0 and 1 are available, when the transfer rate of AMS200 is 1 Gbps or 2 Gbps.
- The port that the Point-to-Point topology has been set to cannot be connected directly to the host, TagmaStore USP or 9900V.

When connecting the AMS200 to the Switch, the Point-to-Point topology is set to the port:

- Connect the AMS200 to the host connector 0. (Do not connect it to the host connector 1.)
- The port that the Loop topology has been set to cannot be connected to the Switch.

When connecting the AMS200 directly to the TagmaStore USP or 9900V, the Loop topology is set to the port:

- Connect it to the host connector 0. (Do not connect anything to the host connector 1.)
- The port that the Point-to-Point topology has been set to cannot be connected directly to TagmaStore USP or 9900V.

4.3.2.2 When the FC Interface Board is Added

The available Fibre Channel connection configuration varies, depending on the topology setting of the AMS200 and the destination of the Fibre Channel cable connection. The following table shows available Fibre Channel connection of each topology setting and connection method.

Table 4.2 Available Fibre Channel Connection Configuration

No.	AMS 200 Topologies	AMS 200 Transfer Rate	Direct Connection to the Host	Switch Connection	Direct Connection to the TagmaStore USP (*Note*) Direct Connection to the 9900V
1	Loop	Auto/1 Gbps/2 Gbps/4 Gbps	Host Connector 0 and 1	Not Supported	Host Connector 0 and 1
2	Point-to-Point	Auto/1 Gbps/2 Gbps/4 Gbps	Not Supported	Host Connector 0 and 1	Not Supported

Note: TagmaStore USP is an abbreviation for TagmaStore Universal Storage Platform, and it is a higher-level model in the TagmaStore series.

When connecting the AMS200 directly to the host, the Loop topology is set to the port:

- The port that the Point-to-Point topology has been set to cannot be connected directly to the host, TagmaStore USP or 9900V.

When connecting the AMS200 to the Switch, the Point-to-Point topology is set to the port:

- The port that the Loop topology has been set to cannot be connected to the Switch.

4.3.3 Fibre Channel Configuration

4.3.3.1 When the FC Interface Board is Not Added

The following Fibre Channel information is not set for each host connector that connects to the AMS200 Fibre Channel.

- Port Address
- Topology
- Transfer Rate
- Adding a Host Group
- Host Group Options
- LU Mapping Information

4.3.3.2 When the FC Interface Board is Added

The host connectors that connect the AMS 200 Fibre Channel interface cable configure the respectively independent port. The information described in section 4.3.3.1is set for each host connector.

4.3.4 Attention to the Host Direct Connection for AMS200

When connecting the AMS200 ports set to the Loop topology directly to both side 0 and side 1 of the host connector (FC interface board addition; side A and side B), consider the following:

4.3.4.1 When the FC Interface Board is Not Added

- **Exclusive Access to the Logical Unit**: LU mapping cannot be set for each host connector of AMS200. It is necessary to set the access path between hosts and logical units according to the assignment of the logical units to the hosts using LUN Manager.
- **Transfer Rate of the Host**: The transfer rate of the AMS200 is set for the port. Both host connectors 0 and 1 must be connected to the hosts with the same transfer rate.

4.3.4.2 When the FC Interface Board is Added

One host connector configures one port.

- Exclusive access to Logical Unit

  LU mapping can be processed for each port. Therefore, set the accessible logical unit for each port using the LU mapping function.

- Transfer rate of host

  The transfer rate for the AMS200 is set for each port. The host connector (side A and side B) can be connected respectively to hosts with different transfer rates.

4.4 NAS Interface

The AMS200 provides up to 8 LAN ports and supports 1000 BASE-T for Gigabit LAN and 100 Mbps-BASE-TX. The AMS200 supports transfer rates of 100 Mbytes/s and 10 Mbytes/s, and controls data transmission using the CSMA/CD method.

Note: Refer to **D.2 Ethernet Connection Specifications** for the supported conditions of switch and so on in this subsystem.

4.5 ISCSI Interface

The AMS200 provides 4 iSCSI ports by adding an optional iSCSI interface board. The iSCSI interface is capable of operating at data transfer speed of up to 100 M bytes/s. The AMS200 supports Ethernet (1000Base-TX). With the HBA for iSCSI, Generic NIC + Software initiator, and Network Switch, the AMS200 subsystem can be located up to 100 meters.

Connect the switch based on the 1000BASE-T(full-duplex). Use the LAN cable with the following types and shapes.

- Cable type: category 5e or category 6
- Connector shape: RJ-45

When you connect the physical port of the switch directly with the host and iSCSI port of the AMS200, do not set the Spanning Tree protocol function to ON. It may cause communication interference.

4.5.1 Setting iSCSI Information

The following iSCSI information is set for iSCSI ports. When the iSCSI interface board is not added to the control unit, this information is not set for each host connector that connects the AMS200 Fibre Channel.

- iSCSI Port IP address
- iSNS Server
- Adding target
- Target option

4.6 Array Frame

The following array frames are described in this section:

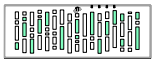
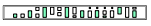
- AMS200 rack-mount model
- AMS200 floor model

4.6.1 AMS200 Rack-Mount Model

Each RKS unit contains the physical disk drives, including the disk array groups and the dynamic spare disk drives. Each rack frame has dual power plugs, which should be attached to two different power sources or power panels.

The AMS200 can be configured with 1 RK and up to 6 RKAJ units for a total of 105 GB disk drives at a maximum of 28.1 Tbytes RAID5(14D+1P) (using the 287.6 G disk drive). The AMS200 can also be configured with 1 RKS and up to 6 RKAJAT units for a total of 105 disk drives at a maximum of 37.0 Tbytes RAID5(14D+1P) (using the 393.9 G disk drive).

Table 4.3 Basic Specifications of Rack-Mount Model

Item Model			Rackmount model			
			RKS	RKAJ	RKAJAT	RKNAS
Configuration	Configuration		1 RKS	1RKAJ	1RKAJAT	1RKNAS
	System appearance					
Disk drive used	Disk drive size (W×D×H) (mm)		101.6×146.1×25.4			–
	Data capacity (G byte) *(Note 1)*		71.3/143.3/287.6		245.7/393.4	–
	Rotational speed (min^{-1})		For 71.3/143.3 G bytes: 10,000/15,000 *(Note 3)* For 287.6 G bytes: 10,000		7,200	–
	Maximum mountable quantity(unit)		15			–
Host interface	Interface type		2 G bps Fibre Channel Optical (Non-OFC) (*Note 3*) 1 Gbps iSCSI (Ethernet) (*Note 5*)	–		1Gbps Ethernet
	Data transfer speed (i.e. maximum speed for transfer to host)		200 M bytes/s (Fibre Channel) (*Note 4*) 100 M bytes/s (iSCSI) (*Note 5*)	–		100 Mbytes/s (Ethernet)
	Number of host connectors	Single controller	Fibre Channel: 1 *(Note 2)* iSCSI: 2 (*Note5*)	(		
		Dual controller	Fibre Channel: 2 (Note 2) iSCSI: 4 (Note5)	(		8 (4 for 1RKNAS)
	Transferred block size (bytes)		512	–		

Note 1: This value of storage capacity is calculated as 1 Gbyte = 1,000,000,000 bytes. (This definition is different from 1 Kbyte = 1,024 bytes.)

Note 2: When FC interface board is not added, one port configures one Mini-HUB, and extends to two host connectors. When FC interface board is added, control unit implements two ports and two host connectors. One port configures FC interface independent of another port, and implements one host connector.

Note 3: When the FC interface board is added, the interface type supports 4 Gbps Fibre Channel Optical (Non-OFC).

Note 4: When the FC interface board is added, a maximum data transfer rate is 400 M bytes/s (Fibre Channel) depending on the host I/O condition.

Note 5: Indicates the value of when iSCSI interface board is added to the control unit.

Note 6: For additional information about the global rack-mount model, refer to *the Acer | HDS AMS200 and WMS100 Global Global 19-Inch Rack Reference Guide*.

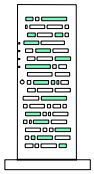
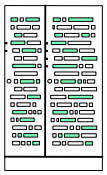
4.6.2 Floor Model

Each floor model contains physical disk drives, including the disk array groups and the dynamic spare disk drives. Additionally, each floor model has dual power plugs, which should be attached to two different power sources or power panels.

Floor (RKS+H1J) Model can be configured with 15 disk drives at a maximum of 4.0 Tbytes RAID5 (using the 287.6 Gbyte disk drive).

Floor (RKS+RKAJ+H2J) Model can be configured with 30 disk drives at a maximum of 8.0 Tbytes RAID5 (using the 287.6 Gbyte disk drive).

Table 4.4 Basic Specifications of the Floor Model

<table>
<tr><td rowspan="2">Item</td><td rowspan="2" colspan="2">Model</td><td colspan="2">Floor Model</td></tr>
<tr><td>Floor (RKS+H1J) Model</td><td>Floor (RKS+RKAJ+H2J) Model</td></tr>
<tr><td rowspan="2">Configuration</td><td colspan="2">Configuration</td><td>1 RKS+Floor setting kit (DF-F700-H1J)</td><td>1 RKS+1RKAJ+Floor setting kit (DF-F700-H2J)</td></tr>
<tr><td colspan="2">System appearance</td><td>  </td><td>  </td></tr>
<tr><td rowspan="4">Disk drive used</td><td colspan="2">Disk drive size (W×D×H) (mm)</td><td colspan="2">101.6×146.1×25.4</td></tr>
<tr><td colspan="2">Data capacity (G byte) (Note 1)</td><td colspan="2">71.3/143.3/287.6</td></tr>
<tr><td colspan="2">Rotational speed (min^{-1})</td><td colspan="2">For 71.3/143.3 G bytes: 10,000/15,000
For 287.6 G bytes: 10,000</td></tr>
<tr><td colspan="2">Maximum mountable quantity (unit)</td><td>15</td><td>30</td></tr>
<tr><td rowspan="5">Host interface</td><td colspan="2">Interface type</td><td colspan="2">2 G bps Fibre Channel Optical (Non-OFC) (Note 3)
1 G bps iSCSI (Ethernet) (Note 5)</td></tr>
<tr><td colspan="2">Data transfer speed (i.e. maximum speed for transfer to host)</td><td colspan="2">200 M bytes/s (Fibre Channel) (Note 4)
100 M bytes/s (iSCSI) (Note 5)</td></tr>
<tr><td rowspan="2">Number of host connectors</td><td>Single controller</td><td colspan="2">Fibre Channel: 2 (Note 2)
iSCSI: 2 (Note 5)</td></tr>
<tr><td>Dual controller</td><td colspan="2">Fibre Channel: 4 (Note 2)
iSCSI: 4 (Note 5)</td></tr>
<tr><td colspan="2">Transferred block size (bytes)</td><td colspan="2">512</td></tr>
</table>

Note 1: This value of storage capacity is calculated as 1 Gbyte = 1,000,000,000 bytes. (This definition is different from 1 Kbyte = 1,024 bytes.)

Note 2: When the FC interface board is not added, one port configures one Mini-HUB, and extends to two host connectors. When the FC interface board is added, control unit implements two ports and two host connectors. One port configures FC interface independent of another port, and implements one host connector.

Note 3: When the FC interface board is added, the interface type supports 4 Gbps Fibre Channel Optical (Non-OFC).

Note 4: When the FC interface board is added, a maximum data transfer rate can be 400 M bytes/s (Fibre Channel) depending on the host I/O condition.

Note 5: Indicates the value of when iSCSI interface board is added to the control unit.

4.7 Component Names, Locations, and Functions

This section includes the following:

- Front bezel component locations and functions
- RKS, RKAJ, and RKAJAT component locations
- Switch locations and functions
- Connector locations and functions
- LED locations and functions

4.7.1 Front Bezel Component Locations and Functions

This section illustrates and describes the locations and functions for the front bezel.

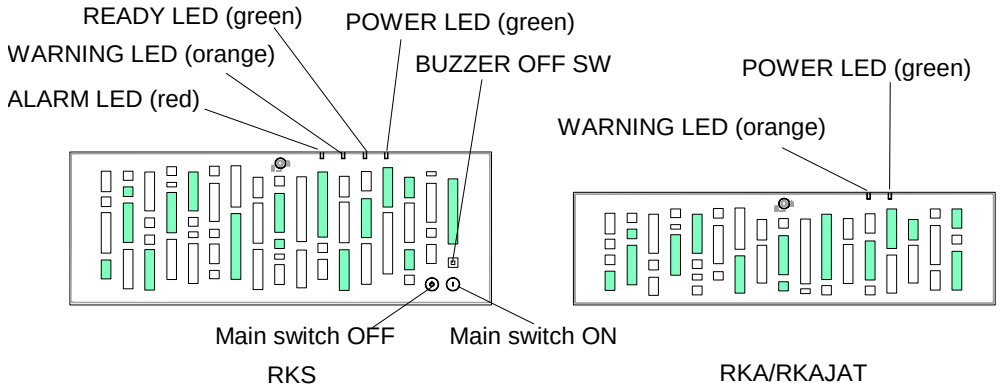
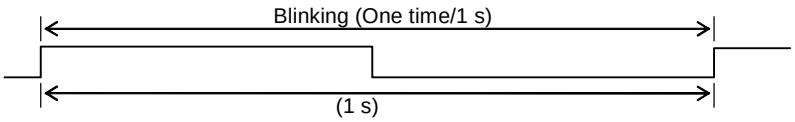


Figure 4.14 RKS, RKA, and RKA/RKAJAT Front Bezel Component Locations

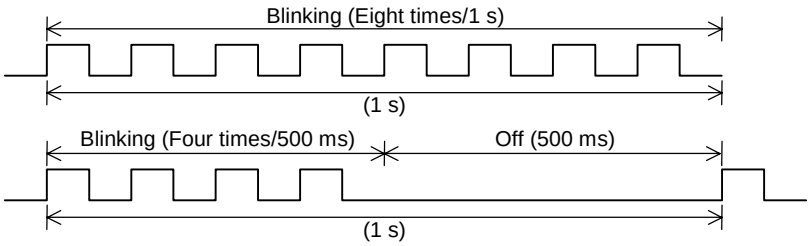
Table 4.5 RKS, RKA, and RKA/RKAJAT Front Bezel Component Functions

Name	Function
ALARM LED (red)	Lighting: Indicates that a failure has occurred which makes the subsystem inoperable. Blinking: Low-speed blinking *(Note 1)*: Indicates that a serious failure has occurred while the power is on.
WARNING LED (orange)	Lighting: Indicates that a failure occurred, but the subsystem is currently operational. Blinking: High-speed blinking *(Note 2)*: Indicates that a failure which does not stop operation occurred in the unit (it must be deleted with WEB). Low-speed blinking *(Note 1)*: Indicates that the latest maintenance revision function of the flash program is executed.
READY LED (green)	Lighting: Indicates that the subsystem is operational. Blinking: High-speed blinking (*Note2*): Indicates that the download of the ENC/SENC firmware is executed. (The READY LED may blink for up to 15 minutes. Even if the READY LED blinks, the subsystem is operational.) Low-speed blinking (*Note1*): Indicates that the offline download processing ended. (It is displayed during the maintenance work.)
POWER LED(green)	Indicates that the power is supplied to the subsystem.
Main switch on	ON: Turns on the power.
Main switch off	OFF Turns off the power.
BUZZER OFF SW	Press this switch when the buzzer sounds to stop the beep. When a serious hardware failure occurs, (electrical surges of both power supplies and so on), the buzzer does not stop even when the button is pushed.

Note1: Low-speed blinking:



Note2: High-speed blinking:



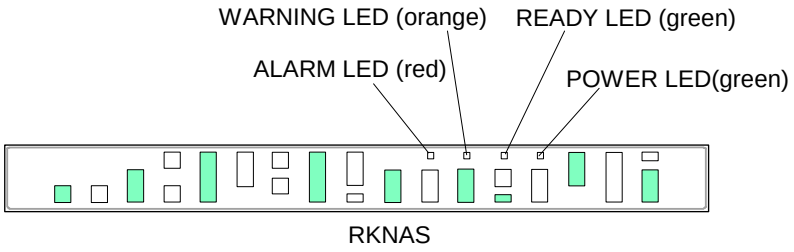


Figure 4.15 RKNAS Front Bezel Component Locations

Table 4.6 RKNAS Front Bezel Component Functions

Name	Function
ALARM LED (red)	Indicates that a failure has occurred which makes the RKNAS inoperable.
WARNING LED (orange)	Indicates that a failure occurred, but RKNAS is currently operational.
READY LED (green)	Indicates that the RKNAS can be operated. (*Note*)
POWER LED(green)	Indicates that the power is supplied to the RKNAS.

Note: When the READY LED on the NAS Unit lights, the NAS unit cannot be accessed from a host computer. A NAS system accepts access from a host computer only in the "ACTIVE" NAS OS state. (Refer to section 3.1.3.)

4.7.2 Component Locations

The locations of the RKS, RKAJ, and RKAJAT components are shown in the following diagrams:

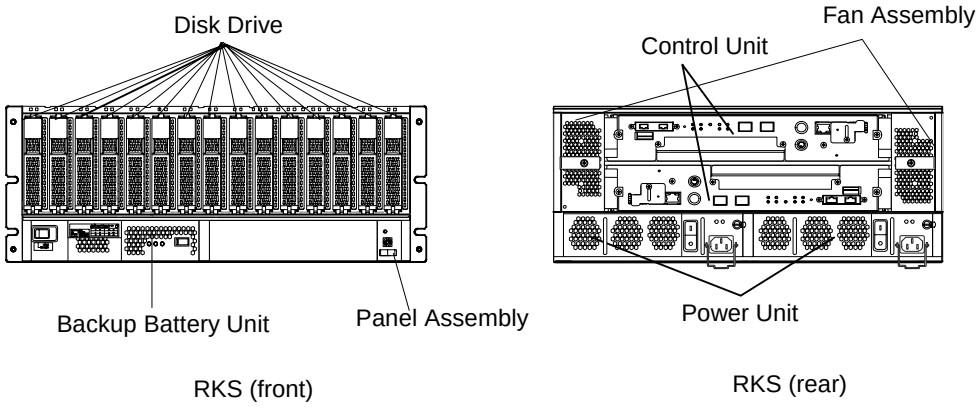


Figure 4.16 RKS Component Locations

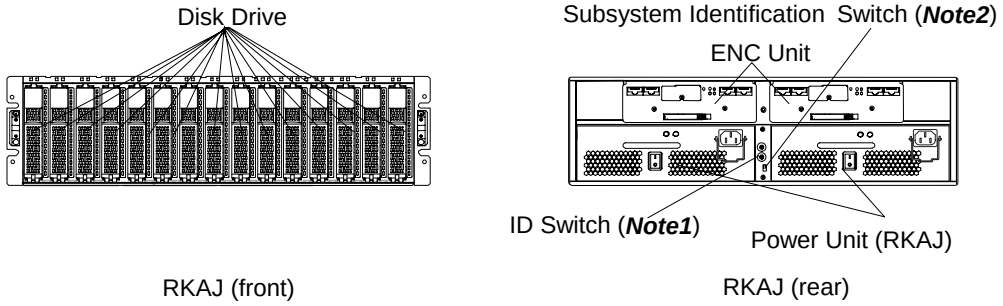


Figure 4.17 RKAJ Component Locations

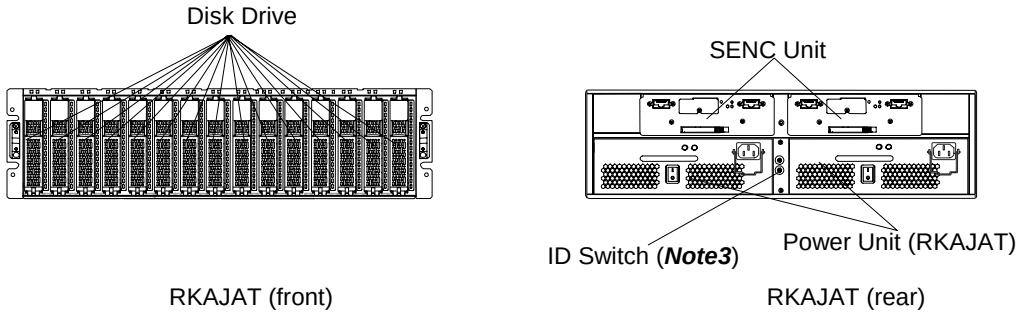


Figure 4.18 RKAJAT Component Locations

Note1: Sets the device ID of the RKAJ.

Note2: The switch has been set on the S side.

Note3: Sets the device ID of the RKAJAT.

4.7.3 Switch Locations and Functions

This section illustrates and describes the locations and functions for switches in the following hardware components:

- Panel assembly
- Backup battery unit
- Power unit
- RKNAS

4.7.3.1 Panel Assembly

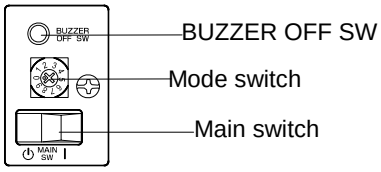


Figure 4.19 Panel Assembly Switch Location

Table 4.7 Panel Assembly Switch Functions

Switch	Function
Main switch	Turns on/off the power: I: Power on O: Power off
Mode switch	Sets the local/remote mode or USP connection by the combination of turning on and off of the four mode switches.
BUZZER OFF SW	Pressing this switch while the buzzer sounds stops the beep. When a serious hardware failure occurs, (electrical surges of both power supplies and so on), the buzzer does not stop even when the button is pushed.

4.7.3.2 Backup Battery Unit

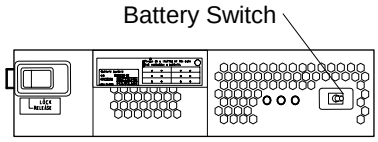


Figure 4.20 Backup Battery Unit Switch Location

Table 4.8 Backup Battery Unit Switch Functions

Switch	Function
Battery Switch	Turns on/off the battery power: When this switch is set to the off, the WARN LED comes on and the buzzer sounds.

4.7.3.3 Power Unit

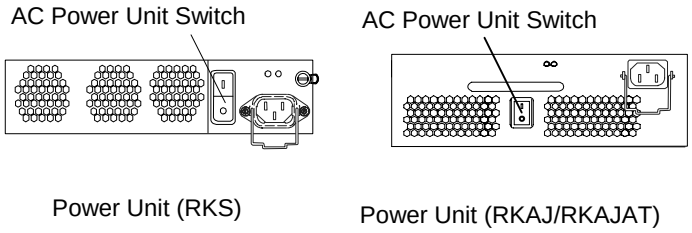


Figure 4.21 Power Unit Switch Locations

Table 4.9 Power Unit Switch Functions

Switch	Function
AC Power Unit Switch	Controls the power applied to the subsystem

4.7.3.4 RKNAS

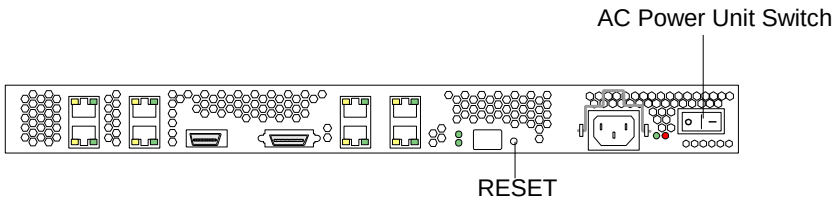


Figure 4.22 RKNAS Switch Locations

Table 4.10 RKNAS Switch Functions

Switch	Function
AC Power Unit Switch	Controls the power applied to the RKNAS
RESET	Used to reset the RKNAS.

4.7.4 Connector Locations and Functions

This section illustrates and describes the locations and functions for connectors in the following hardware components:

- ENC unit
- Power unit
- Control unit
- RKNAS

4.7.4.1 ENC Unit

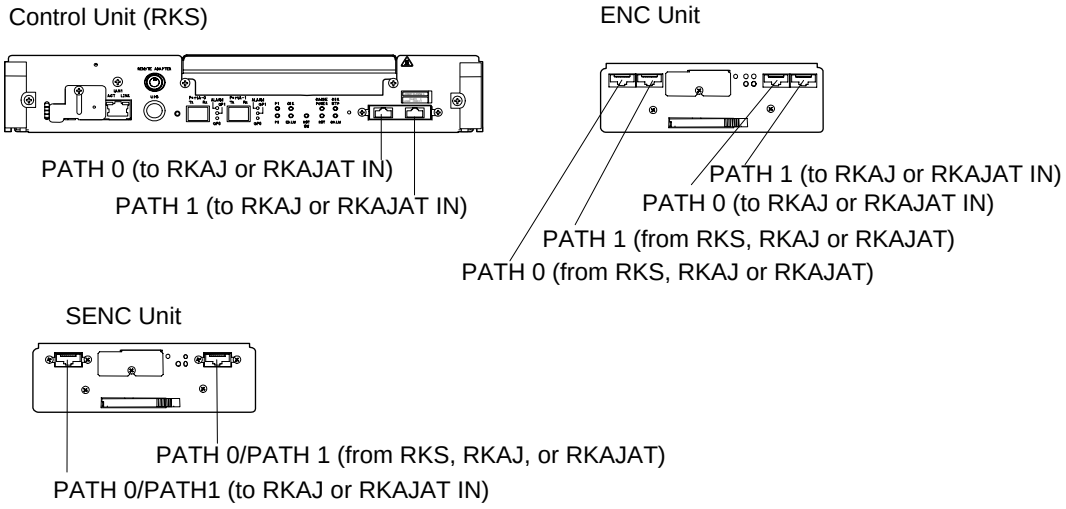

Control Unit (RKS)
ENC Unit
PATH 0 (to RKAJ or RKAJAT IN)
PATH 1 (to RKAJ or RKAJAT IN)
PATH 1 (to RKAJ or RKAJAT IN)
PATH 0 (to RKAJ or RKAJAT IN)
PATH 1 (from RKS, RKAJ or RKAJAT)
PATH 0 (from RKS, RKAJ or RKAJAT)
SENC Unit
PATH 0/PATH 1 (from RKS, RKAJ, or RKAJAT)
PATH 0/PATH1 (to RKAJ or RKAJAT IN)

Figure 4.23 ENC Unit Connector Locations

Table 4.11 Power Unit Connector Functions

Connector	Function
PATH 0	Connection connector for RKAJ Unit ID = 0n (n=0,1,2....E) Connection connector for RKAJAT Unit ID = 2n (n=0,1,2....E)
PATH 1	Connection connector for RKAJ Unit ID =0n (n=0,1,2....E) Connection connector for RKAJAT Unit ID =3n (n=0,1,2....E)

4.7.4.2 Power Unit

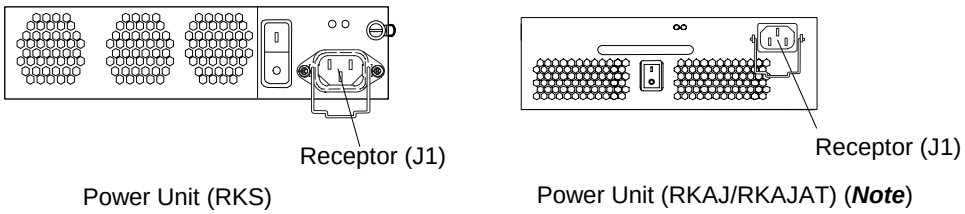


Figure 4.24 Power Unit Connector Locations

Note: The additional battery unit is only available in Japan.

Table 4.12 Power Unit Connector Functions

Connector	Function
Receptor (J1)	Power cable receptacle on the unit side

4.7.4.3 Control Unit

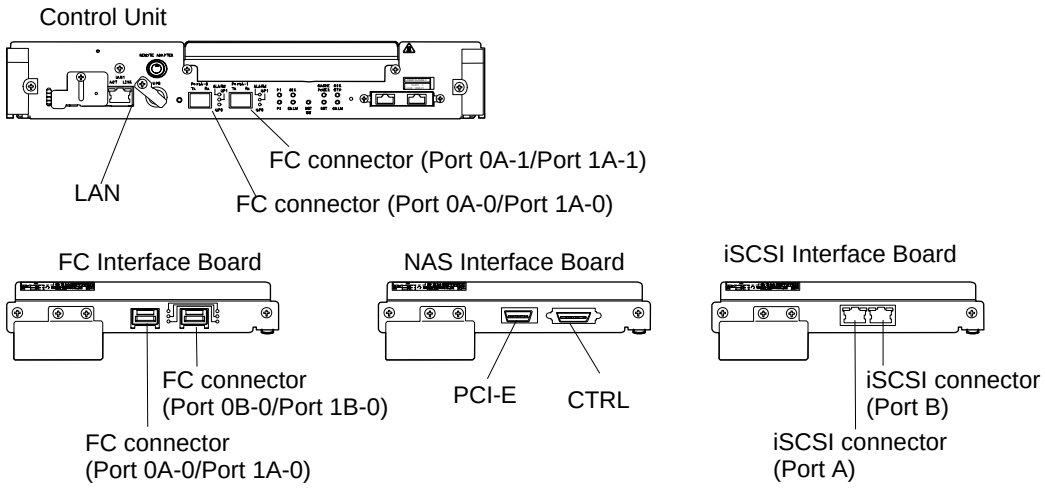


Figure 4.25 Control Unit Connector Locations

Table 4.13 Control Unit Connector Functions

Connector	Function
FC connector	Connector for a Fibre channel interface cable
LAN	Connector used to connect a LAN cable
PCI-E	Connector for a PCI-E cable
CTRL	Connector for a CTRL cable
iSCSI	Connector for an iSCSI interface cable

4.7.4.4 RKNAS

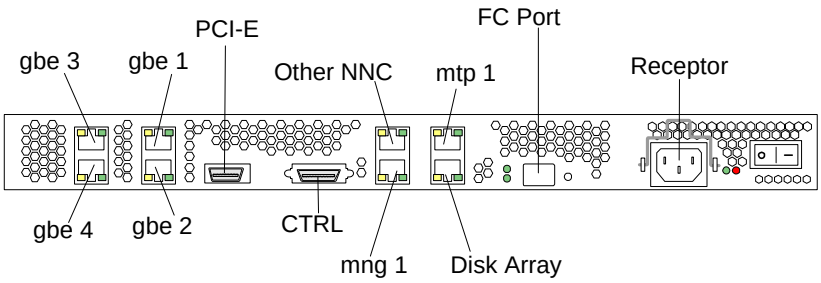


Figure 4.26 RKNAS Connector Locations

Table 4.14 RKNAS Connector Functions

Connector	Function
Receptor (J1)	Power cable receptacle on the RKNAS side.
gbe 1	Connector used to connect LAN cable: gbe 1.
gbe 2	Connector used to connect LAN cable: gbe 2.
gbe 3	Connector used to connect LAN cable: gbe 3.
gbe 4	Connector used to connect LAN cable: gbe 4.
PCI-E	Connector for a PCI-E cable
CTRL	Connector for a CTRL cable
mng 1	Connector used to connect a LAN cable for user management.
Other NNC	Connector used to connect a LAN cable for connecting with another RKNAS in the cluster configuration.
Disk Array	Connector used to connect with the LAN port for maintenance in the DF Controller.
mtp 1	Connector for the LAN for maintenance
FC Port	Connector for the backup subsystem

4.7.5 LED Locations and Functions

This section illustrates and describes the locations and functions of LEDs in the following hardware components:

- Disk drive display
- Battery backup unit
- ENC unit
- SENC unit
- Power unit
- Fan assembly
- Control unit
- RKNAS

4.7.5.1 Disk Drive Display (RKS)

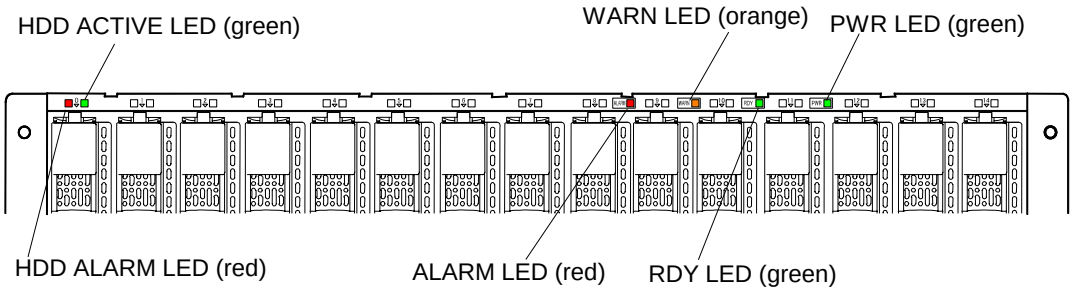
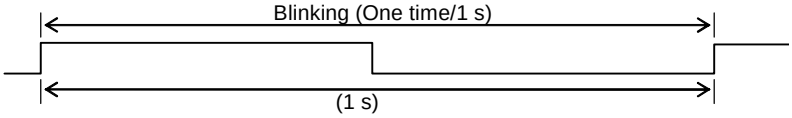


Figure 4.27 Disk Drive Display LED Locations

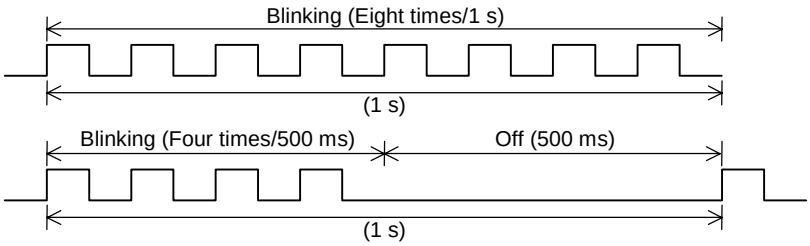
Table 4.15 Disk Drive Display LED Functions

LED	Function
HDD ACTIVE LED (green)	When on or flashing, it indicates that the disk drive is operational.
HDD ALARM LED (red)	When on, it indicates that a failure occurred in the disk drive; the disk drive is inoperable.
ALARM LED (red)	Lighting: When on, it indicates that a failure occurred in the unit; the unit is inoperable. Blinking: Low-speed blinking (*Note 1*)*:* Indicates that a serious failure has occurred while the power is on.
RDY LED (green)	Lighting: When on, it indicates that the unit is operable. Blinking: High-speed blinking (*Note2*): Indicates that the download of the ENC/SENC firmware is executed. (The READY LED may blink for up to 15 minutes. Even if the READY LED blinks, the subsystem is operational.) Low-speed blinking (*Note1*): Indicates that the offline download processing ended. (It is displayed during the maintenance work.)
WARNING LED (orange)	Lighting: When on, it indicates that a failure occurred in the unit; the unit is inoperable. Blinking: High-speed blinking (*Note 2*)*:* Indicates that a failure which does not stop operation occurred in unit (It must be deleted with WEB). Low-speed blinking (*Note 1*): Indicates that the latest maintenance revision function of the flash program is executed.
PWR LED (green)	When on, it indicates that electricity is supplied to the unit.

Note1: Low-speed blinking:



Note2: High-speed blinking:



4.7.5.2 Disk Drive Display (RKAJ, RKAJAT)

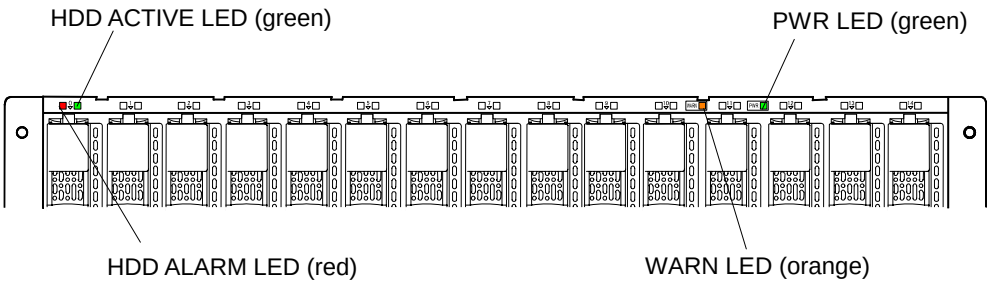


Figure 4.28 Disk Drive Display (RKAJ., RKAJAT) LED Locations

Table 4.16 Disk Drive Display (RKAJ, RKAJAT) LED Functions

LED	Function
HDD ACTIVE LED (green)	When on or flashing, it indicates that the disk drive is operational.
HDD ALARM LED (red)	When on, it indicates that a failure occurred in the disk drive; the disk drive is inoperable.
WARN LED (orange)	When on, it indicates that a failure occurs in the unit, so the unit is inoperable.
PWR LED (green)	When on, it indicates that electricity is supplied to the unit.

4.7.5.3 Battery Backup Unit

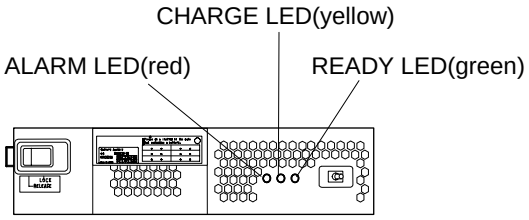


Figure 4.29 Battery Backup Unit LED Locations

Table 4.17 Battery Backup Unit LED Functions

LED	Function
READY LED (green)	When on, flashing, or off, it indicates the condition of the battery.
CHARGE LED (yellow)	When on or flashing, it indicates the charging status of the battery.
ALARM LED (red)	When on, it indicates that a failure occurs in the battery. When flashing or off, it indicates the condition of the battery.

4.7.5.4 ENC Unit

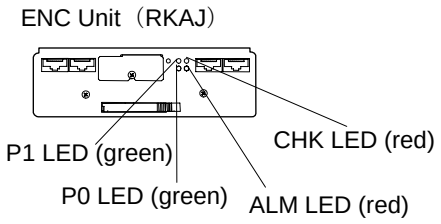
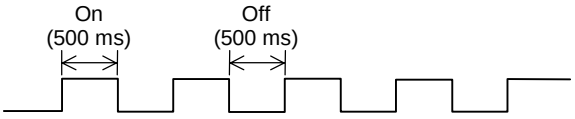


Figure 4.30 ENC Unit LED Locations

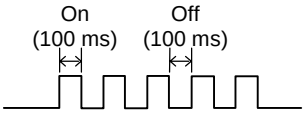
Table 4.18 ENC Unit LED Functions

LED	Function
P1 LED (green)	When on, it indicates that the link status of FC-AL (loop 1 side) is normal.
P0 LED (green)	When on, it indicates that the link status of FC-AL (loop 0 side) is normal.
ALM LED (red)	When on, it indicates that a failure occurs in the ENC Unit, so the ENC Unit is inoperable.
CHK LED (red)	It indicates, according to the number of times the LED flashes, what voltage is abnormal. Low-Speed blinking (*Note1*) Once: Logic +5 V voltage is abnormal. Twice: Logic +12 V voltage is abnormal. Three times: Logic +3.3 V voltage is abnormal. Five times: Battery is abnormal. Six times: ENC unit Logic+2.5V voltage is abnormal. Seven times: BS 1.8 V, BS 3.3 V, or BS 12 V voltage is abnormal. The following blinking is fast because ENC microprogram detects CUDG error. High-speed blinking (*Note2*) Once: SRAM error. Twice: ENC hard error. Three times: Microprogram error in flash memory. Not blinking: Boot section error of ENC microprogram, RAM error, or ENC hard configuration error.

Note1: Normal blinking:



Note2: High-speed blinking (CHK LED):



4.7.5.5 SENC Unit

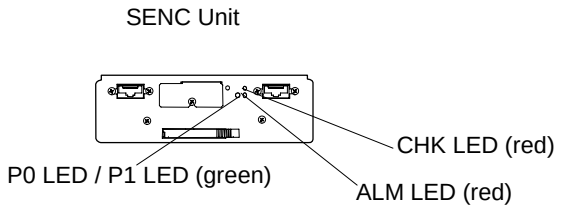
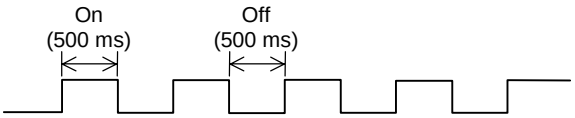


Figure 4.31 SENC Unit LED Locations

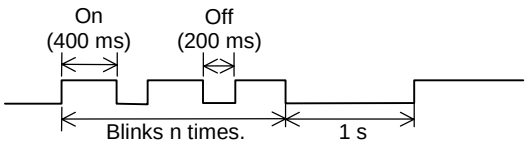
Table 4.19 SENC Unit LED Functions

LED	Function
P0 LED/P1 LED (green)	When on, it indicates that the link status of FC-AL (loop 0 or loop 1 side) is normal.
ALM LED (red)	When on, it indicates that a failure occurs in the SENC Unit.
CHK LED (red)	After turning on the power, it blinks for about 10 seconds (while CUDG is being executed). However, this blinking does not indicate an abnormal state. It indicates error factors by the frequency of blinks. Low-speed blinking (*Note 1*)*:* Twice: CUDG error in SENC Eight times: Selector circuit of the fan is abnormal. Lighting: CUDG error in BOOT section of SENC High-speed blinking (*Note 2*): Five times: Fixed data error in flash memory. Six times: Significant surface error in flash memory Seven times: SUM check error in flash memory

Note1: Normal blinking:



Note2: High-speed blinking:



4.7.5.6 Power Unit

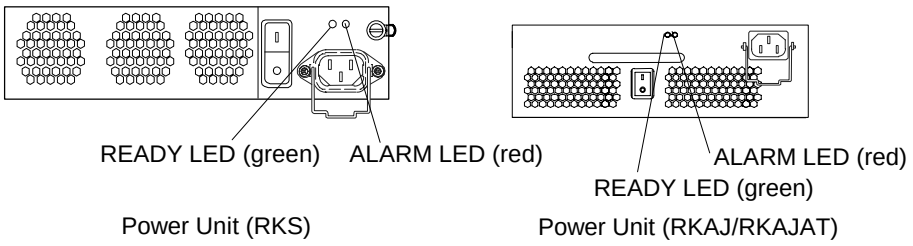


Figure 4.32 Power Unit LED Locations

Table 4.20 Power Unit LED Functions

LED	Function
READY LED (green)	When on, it indicates the operating normally.
ALARM LED (red)	When on, it indicates the abnormal or in a stop state.

4.7.5.7 Fan Assembly

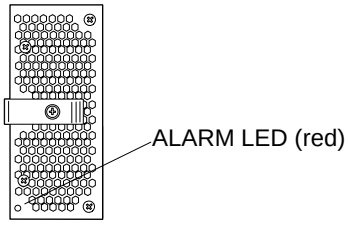


Figure 4.33 Fan Assembly LED Locations

Table 4.21 Fan Assembly LED Functions

LED	Function
ALARM LED (red)	When on or off, it indicates the operating status of the fan assembly. On: It is abnormal. Off: It is operating normally or in a stop state.

4.7.5.8 Control Unit

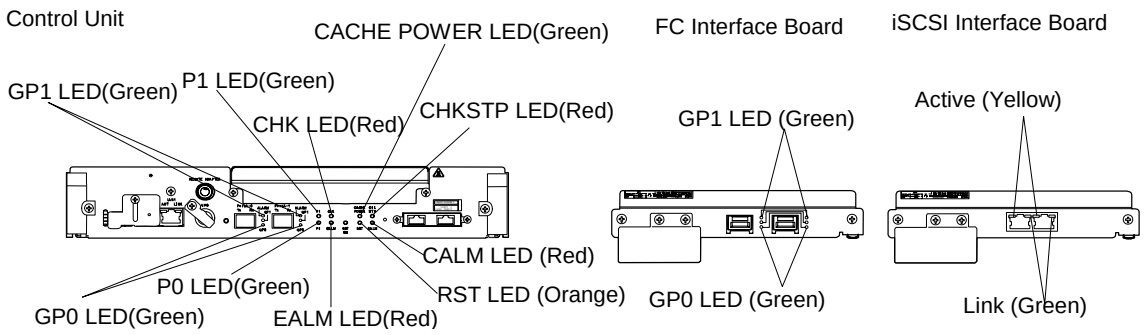


Figure 4.34 Control Unit LED Locations

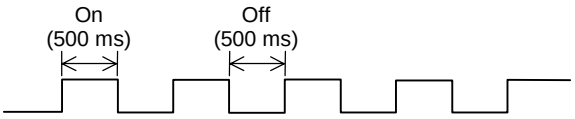
Table 4.22 Control Unit LED Functions

LED	Function
P1 LED (green)	When on, it indicates that the link status of FC-AL (loop 1 side) is normal.
P0 LED (green)	When on, it indicates that the link status of FC-AL (loop 0 side) is normal.
EALM LED (red)	Indicates error factors by the lighting or blinking pattern. Lighting: When on, it indicates that a failure occurs in the controller (ENC side), so the controller is inoperable. Blinking: Normal blinking (*Note 1*) (CHK LED is on): An exceptional process error detected by the ENC microprogram. High-speed blinking (*Note 2*) (CHK LED is on): An exceptional process error detected by the ENC microprogram. (stack over) Normal blinking: (*Note 1*) (CHK LED is off): Indicates that FLASH write is performed during the ENC microprogram download. (It is not in the abnormal status.)
CHK LED (red)	It indicates error factors by means of number of blinks: Low-Speed blinking (Note3) Once: Drive +5 V voltage is abnormal. Twice: Drive +12 V voltage is abnormal. Five times: Battery is abnormal. Six times: Voltage on the controller is abnormal. (Reset of the controller is not canceled) Seven times: BS 12 V voltage is abnormal. Nine times: Fan assembly is abnormal. The following blinking is fast because ENC microprogram detects CUDG error: High-speed blinking (*Note4*) Once: SRAM error. Twice: ENC hard error. Three times: Microprogram error in flash memory. Not blinking: Boot section error of ENC microprogram, RAM error, or ENC hard configuration error.
CACHE POWER LED (green)	When on or off, it indicates the status of the cache memory backup operation. On: Backup operation is in execution. Off: Backup operation is not in execution.
RST LED (orange)	When on, it indicates that the controller is resetting.
CALM LED (red)	When on, it indicates that a failure occurs in the controller (CTL side), so the controller is inoperable.
GP0 LED (green)	It indicates the status of the interface installed in the controller is normal.
GP1 LED (green)	It indicates the status of the interface installed in the controller is normal.

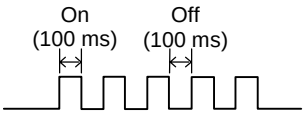
Table 4.22 Control Unit LED Functions

LED	Function
CHKSTP LED (red)	When on, it indicates that a failure occurs in the controller (CTL side), so the controller is inoperable.
Active (yellow)	When on, it indicates that the link status is normal.
Link (green)	When on, it indicates that data is being transferred.

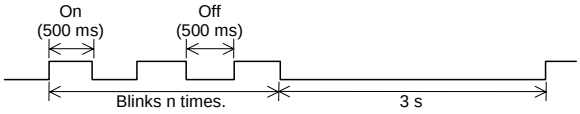
Note1: Normal blinking:



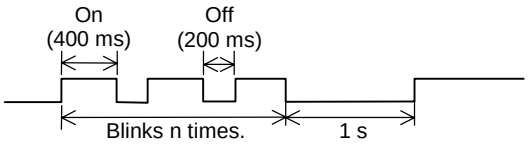
Note2: High-speed blinking (EALM LED):



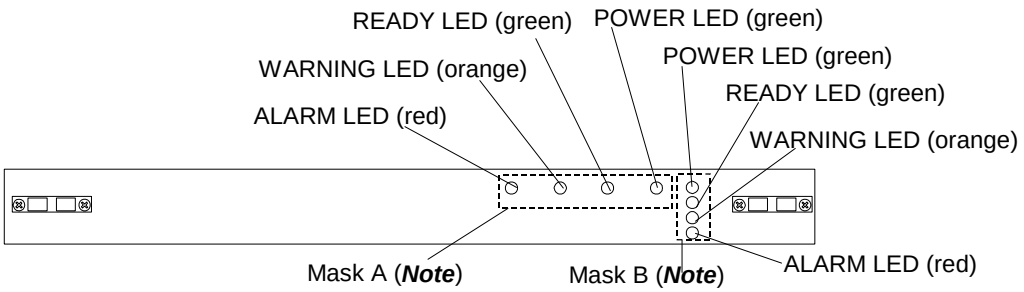
Note3: Low-speed blinking:



Note4: High-speed blinking (CHK LED):



4.7.5.9 RKNAS



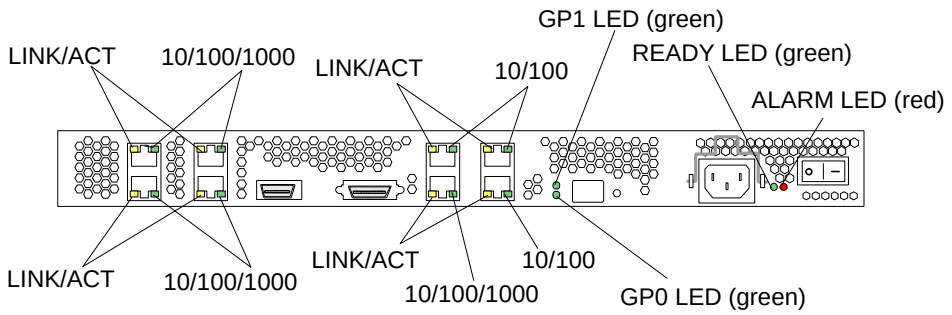
RKNAS (front)

Note: Mask A or Mask B has been affixed.

Figure 4.35 RKNAS LED Locations (front)

Table 4.23 RKNAS LED Functions (front)

LED	Function
ALARM LED (red)	Indicates that a failure has occurred which makes the RKNAS inoperable.
WARNING LED (orange)	Indicates that a failure occurred, but RKNAS is currently operational.
READY LED (green)	Indicates that the RKNAS can be operated.
POWER LED(green)	Indicates that the power is supplied to the RKNAS.



Note: Mask A or Mask B has been affixed.

Figure 4.36 RKNAS LED Locations (rear)

Table 4.24 RKNAS LED Functions (rear)

LED	Function
LINK/ACT	Indicates that the LAN for management is linked or transferring the data. Green: linked Orange: during the data transfer
10/100/1000	Indicates the transfer rate of the LAN for management Off: 10 M, Green: 100M, Orange: 1000M
10/100	Indicates the transfer rate of the LAN for management Off: 10 M, Green: 100M
READY LED (green)	When on, it indicates that the AC/DC power supply operates normally. When off, it indicates that the AC/DC power supply is abnormal or in a stop state.
ALARM LED (red)	When on, it indicates that a failure occurs in the AC/DC power supply.
GP0 LED (green)/ GP1 LED (green)	It indicates the status of the interface installed in the controller is normal.

Chapter 5 Functional and Operational Characteristics

This chapter includes a description of the following:

- New AMS200 Features and Capabilities
- RAID Implementations
- Cache Management
- Logical Units
- Open System Features and Functions
- Data Management Features and Functions
- Copy Solution Features and Functions
- Performance Management Features and Functions
- NAS Features and Functions
- iSCSI Features and Functions

This chapter provides information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide an explanation for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
5.1	New AMS200 Features and Capabilities	○	○	○
5.2	RAID Implementations	○	○	○
5.3	Cache Management	○	○	○
5.4	Logical Units (LUs)	○	○	○
5.5	5.5.1 Open System Middleware	○	–	○
	5.5.2 LUN Management	○	–	○
5.6	5.6.1 Cache Residency Manager Function	○	○	○
	5.6.2 LUN Manager Function	○	–	○
	5.6.3 Data Retention Utility Function	○	–	○
	5.6.4 LUN Expansion Function	○	○	○
	5.6.5 Password Protection Function	○	○	○
5.7	5.7.1 ShadowImage In-System Replication Function	○	–	○
	5.7.2 Copy-On-Write Snapshot Function	○	–	○
	5.7.3 NAS Backup Restore Modular Function	–	○	–
	5.7.4 NAS SyncImage Modular Function	–	○	–
5.8	5.8.1 Performance Monitor Function	○	○	○
	5.8.2 Cache Partition Manager Function	○	○	○
5.9	NAS Features and Functions	–	○	–
5.10	iSCSI Features and Functions	-	-	○

○: The explanation is provided.
—: The explanation is not provided.

5.1 New AMS200 Features and Capabilities

The Hitachi AMS200 subsystem offers the following new or improved features and capabilities, which distinguish the AMS200 subsystem from the 9200 subsystem:

- Up to 15 spare disks installable (floor RKS+H1JModel: up to 1).
- 512 logical unit numbers maximum.
- Multiple parity groups allocatable for one RAID group.
- 25 RAID groups maximum.
- The drive interface supports 2 Gbps Fibre Channel.
- A maximum of 4 Gbytes high capacity cache is supported in the dual configuration. It improves the cache percent hit rate.
- The file sharing function supported by connecting to the NAS unit
- 1 Gbps iSCSI supported by adding iSCSI interface

5.2 Raid Implementations

The AMS200 subsystem supports RAID0, RAID1, RAID 5, RAID 6, and RAID1+0. RKAJAT does not support RAID0.

- RAID0 group stripes data across all disk drives in the group to attain higher throughput. There is no sparing disk drive function with this configuration.

  Notes on Using RAID0:

  - When a failure occurs in a disk drive, data cannot be restored internally within the disk array because RAID0 has no redundancy of data; therefore, although the host receives an error message, the data is left in its current state.
  - Unlike with an independent disk drive, error block management (assignment of alternative block for the independent disk drive with the Reassign Blocks command) is not done. Therefore, when a RAID0 disk drive becomes inaccessible due to a failure, all the LUs in the RAID0 configuration including the failed disk drive become inaccessible. Restoration of user data with backup data is essential after replacing the failed disk drive.
  - Do not allow RAID0 to coexist with the other RAID group; do not form a group with two or more RAID0 systems. An example = (4D + 1P) × 2 + 2D.
  - Each time a failure occurs in a RAID0 disk drive, data that cannot be written into the disk drive (pinned data) is accumulated in the cache.
  - When the amount of accumulated data exceeds a certain value, a write I/O instructed to the other RAID group cannot be accepted and the system goes down. (In this case, restoration of user data and resynchronization of a file system using the backup data are required for the entire subsystem; therefore, the time necessary for recovery is lengthy.)
  - Do not adopt the RAID0 configuration to its fullest extent. Consider the above notes when building the configuration.

- RAID1+0 groups provide data redundancy like RAID1 by copying all the contents of two disk drives to another pair. Different from RAID1, data striping is performed for a maximum of 16 sets of two disk drives.
- RAID1 array groups consist of at least two disk drives in a mirrored configuration. Data is mirrored across the groups of two adjacent drives. The stripe consists of two data chunks.
- RAID5 applies 2 to 15 data disks and has a parity disk which performs the data stripping.
- RAID 6 applies 2 to 28 data disks, and has two parity disks performing the data stripping. Configuration with two parity disks provides redundancy that can sustain two point failures.

The RAID specification is shown in the following table:

Table 5.1 Rack-Mount and Floor Model RAID Specifications

Item	Model		Rack-Mount Model		
			RKS	RKAJ	RKAJAT
RAID specifications	RAID level		0/1/5/6/1+0		1/5/6/1+0
	RAID Configuration (unit of addition)	RAID0	2D～16D		
		RAID1	1D+1D		
		RAID 5	2D+1P～15D+1P		
		RAID 6	2D+2P～15D+2P		
		RAID 1+0	2D+2D～8D+8D		

Note: For information about the global rack-mount model, refer to the *Acer | HDS AMS200 and WMS100 Global Global 19-Inch Rack Reference Guide*.

Table 5.2 Floor Model RAID Specifications

Item	Model		Floor Model	
			Floor (RKS+H1J) Model	Floor (RKS+RKAJ+H2J) Model
RAID specifications	RAID level		0/1/5/6/1+0	
	RAID Configuration (unit of addition)	RAID0	2D～15D	2D～16D
		RAID1	1D+1D	
		RAID 5	2D+1P～14D+1P	2D+1P～15D+1P
		RAID 6	2D+2P～15D+2P	2D+2P～15D+2P
		RAID 1+0	2D+2D～7D+7D	2D+2D～8D+8D

5.3 Cache Management

Cache management features include the following:

- Data is stored in cache when reading and writing; it is dynamically managed, depending on the workload read and write I/O characteristics. A high percent cache hit rate is expected, due to transaction processing (data is updated after it is referenced). System throughput is increased by the reduced data writing time.
- Writing completion is reported to the host at the same time the data is written onto the cache; the write operation onto the disk will be asynchronously performed later. The host can perform the next process without waiting for the write operation onto disk.
- The data written onto the cache is saved in the event of an electric power failure due to the nonvolatile cache. The data is assured for 24 hours on the full charge of a standard configuration.
- One specified logical unit on each controller can be resident in cache. High throughput can be realized for the specified logical unit since a 100% cache percent hit rate is expected when reading and writing from the host.

Cache specifications are shown in the following tables:

Table 5.3 Rack-Mount Model Cache Specifications

Item	Model	Rack-Mount Model	
		RKS	RKAJ
Cache specifications	Capacity (M bytes/CTL)	1,024 to 2,048	-
	Control method	Read LRU (*Note*) /Write after	-
	Battery backup	Provided	-
	Backup duration (h)	24 (When cache of 2,048 M bytes/CTL is installed)	-

Note: LRU is an abbreviation for Least Recently Used.

Note: For information about the global rack-mount model, refer to the *Acer | HDS AMS200 and WMS100 Global Global 19-Inch Rack Reference Guide*.

Table 5.4 Floor Model Cache Specifications

Item	Model	Floor Model	
		Floor (RKS+H1J) Model	Floor (RKS+RKAJ+H2J) Model
Cache specifications	Capacity (M bytes/CTL)	1,024 to 2,048	
	Control method	Read LRU/Write after (see *Note*)	
	Battery backup	Provided	
	Backup duration (h)	24 (When cache of 2,048 M bytes/CTL is installed)	

Note: LRU is an abbreviation for Least Recently Used.

5.4 Logical Units (LUs)

The AMS200 supports up to 512 LUNs. Each LU is identified by fibre-channel port ID and LUN number. However, up to 256 LUs can be assigned to a host group.

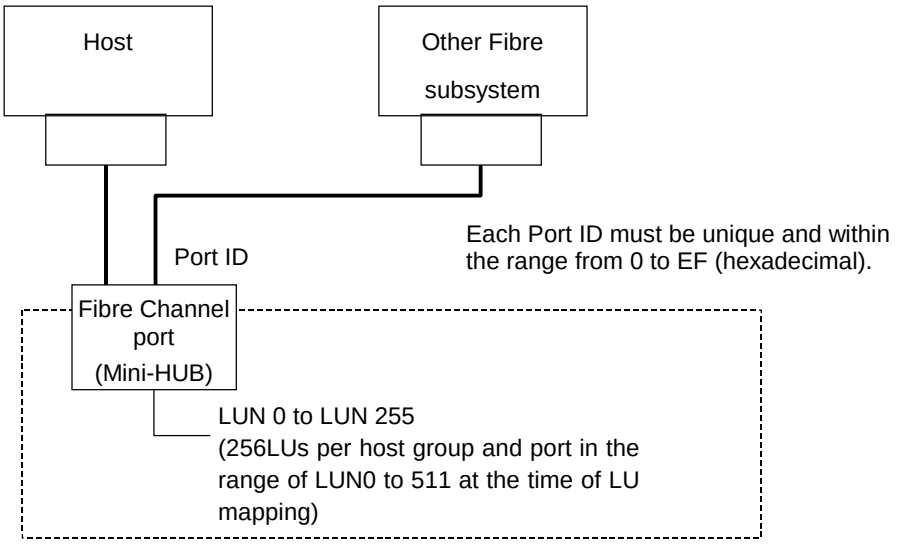

Host
Other Fibre
subsystem
Each Port ID must be unique and within the range from 0 to EF (hexadecimal).
Port ID
Fibre Channel port
(Mini-HUB)
LUN 0 to LUN 255
(256LUs per host group and port in the range of LUN0 to 511 at the time of LU mapping)

Figure 5.1 Logical Units (Without the FC interface board addition to the control unit)

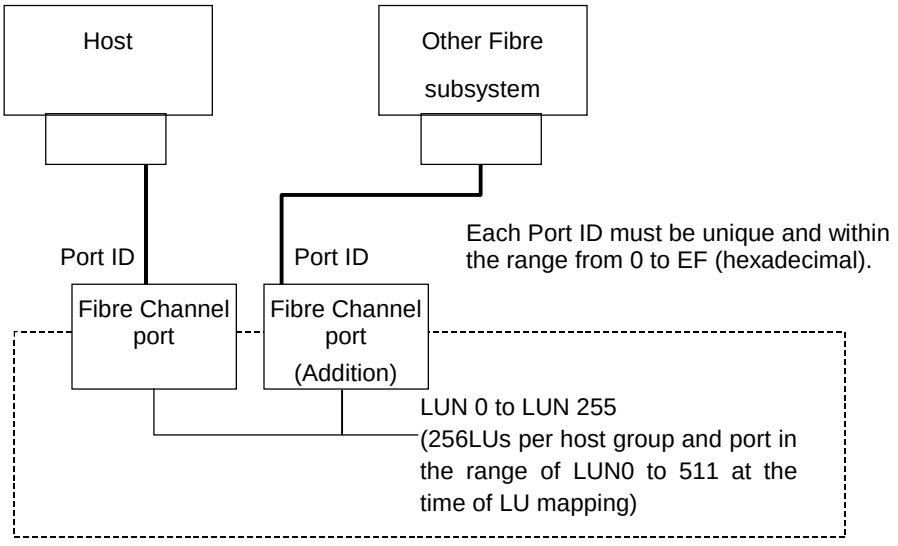

Host
Other Fibre
subsystem
Each Port ID must be unique and within the range from 0 to EF (hexadecimal).
Port ID
Port ID
Fibre Channel port
Fibre Channel port
(Addition)
LUN 0 to LUN 255
(256LUs per host group and port in the range of LUN0 to 511 at the time of LU mapping)

Figure 5.2 Logical Units (With the FC interface board addition to the control unit)

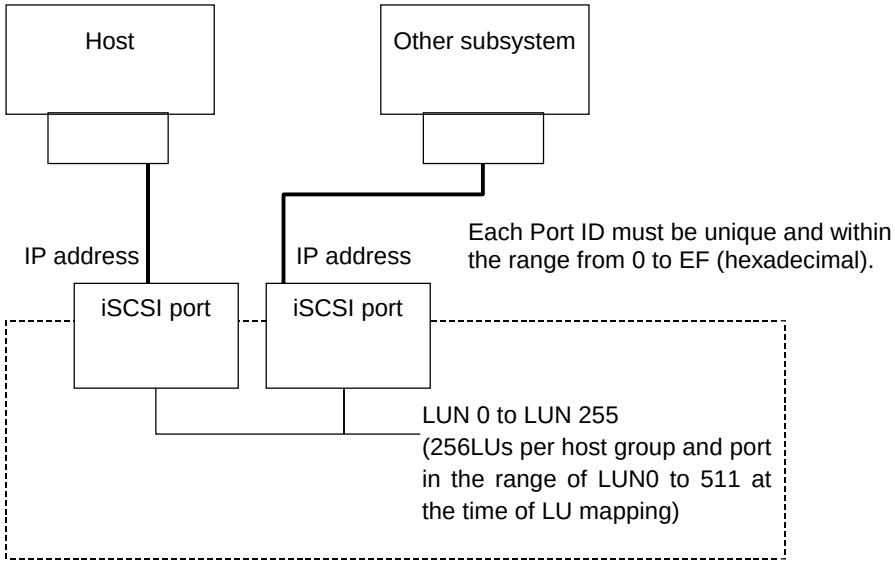

Host
Other subsystem
IP address
IP address
Each Port ID must be unique and within the range from 0 to EF (hexadecimal).
iSCSI port
iSCSI port
LUN 0 to LUN 255
(256LUs per host group and port in the range of LUN0 to 511 at the time of LU mapping)

Figure 5.3 Logical Units (With the iSCSI interface board addition to the control unit)

When the AMS200 is used as a NAS model, nine logical units need to be assigned as system LUs. A maximum of 503 logical units can be set for a user LU.

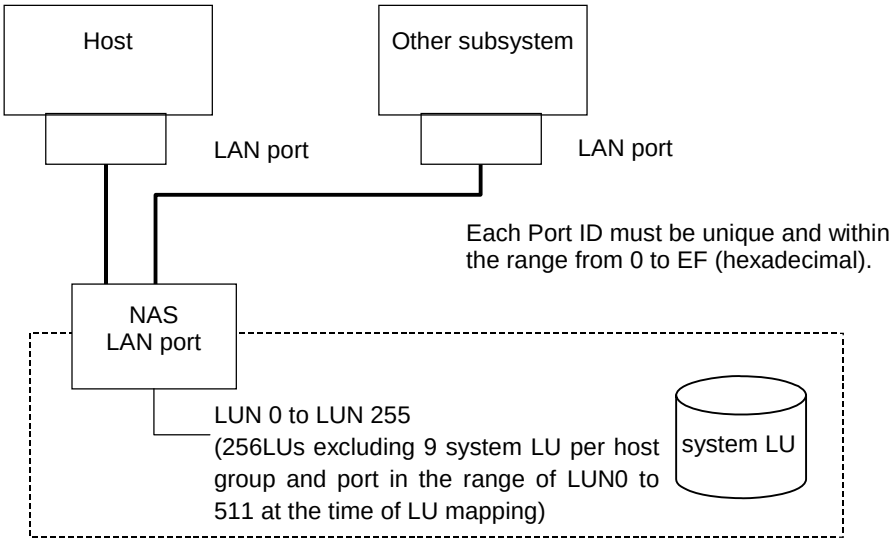

Host
Other subsystem
LAN port
LAN port
Each Port ID must be unique and within the range from 0 to EF (hexadecimal).
NAS
LAN port
LUN 0 to LUN 255
(256LUs excluding 9 system LU per host group and port in the range of LUN0 to 511 at the time of LU mapping)
system LU

Figure 5.4 Logical Units (NAS Model)

5.5 Open Systems Features and Functions

The AMS200 subsystem offers many features and functions specifically for the open-systems environment. The AMS200 subsystem also supports important open-system functions, such as fibre-channel arbitrated-loop (FC-AL) and fabric topologies, command tag queuing, multi initiator I/O, and most industry-standard software and middleware products which provide host fail-over, I/O path fail-over, and logical volume management functions.

5.5.1 Open Systems Middleware

Open-system middleware products provide host fail-over capability, I/O path fail-over support, and logical volume management in the open-systems environment. Middleware is not usually supplied as part of the basic operating system.

5.5.2 Logical Unit Mapping

Each LUN can be assigned to multiple fibre-channel ports or iSCSI ports to provide I/O path fail-over with middleware support.

5.6 Data Management Features and Functions

These features include:

- Cache Residency Manager Function
- LUN Manager Function
- Data Retention Utility Function
- LUN Expansion Function
- Password Protection Function

5.6.1 Cache Residency Manager Function

The Cache Residency Manager function ensures that all data in an LU is stored in cache memory. All read/write commands to the LU can be executed by cache hit 100% without accessing the drive. The system throughput is improved when this function is applied to an LU that contains data accessed frequently because no latency period is needed to access the disk drive.

5.6.2 LUN Manager Function

The LUN Manager has four main functions: Fibre security control and host group (for Fibre Channel interface), or iSCSI security control and target (for iSCSI interface).

- Fibre Channel Interface

  The Fibre security control function controls the access from specific hosts or specific commands.

  This function enables the subsystem to respond to each connected host (even within the same port) by grouping connected hosts within a port and setting the logical unit mapping and the Host Connection mode for each host group.

- iSCSI Interface

  The iSCSI security function controls access from specified hosts or specific commands.

  The target group function enables the subsystem to respond to each connected host (even within the same port) by grouping the connected hosts within a port and setting the locial unit mapping and Host Connection mode for each group. Up to 128 targets can be set for one port. Authentication can be performed for each target by using the CHAP authentication concurrently.

5.6.3 Data Retention Utility Function

The Data Retention Utility feature prevents the logical unit (volume) from being accessed illegally by the host.

5.6.4 LUN Expansion Function

The LUN Expansion function expands the size of a logical unit (volume) accessed by a host computer by combining multiple logical units (volumes) internally.

5.6.5 Password Protection Function

The Password Protection function restricts the number of Storage Navigator Modular users who are allowed to access a disk array subsystem; it also prevents simultaneous access from multiple users.

5.7 Copy Solution Features and Functions

The AMS200 subsystem provides features and functions which allow you to maintain remote and subsystem internal copies of all user data on the AMS200 storage subsystem for data backup or duplication. These features include:

- ShadowImage In-System Replication Function
- Copy-On-Write Snapshot Function
- NAS Backup Restore Modular Function
- NAS SyncImage Modular Function

5.7.1 ShadowImage In-System Replication Function

The Hitachi Data Systems ShadowImage In-System Replication function enables you to maintain subsystem-internal copies of all user data on the AMS200 storage subsystem for purposes such as data backup or duplication. The duplicated volumes are created within the same AMS200 subsystem as the primary volume.

ShadowImage In-System Replication operations are non-disruptive and allow the primary (main) volume of each volume pair to remain online to all hosts for both read and write I/O operations. Once established, ShadowImage In-System Replication operations continue unattended to provide asynchronous internal data backup. Usability is further enhanced through a resynchronization capability that reduces data duplication requirements and backup time, thereby increasing user productivity.

5.7.2 Copy-On-Write Snapshot Function

The Hitachi Copy-On-Write Snapshot feature enables you to maintain a logical copy of logical units (volumes) at a point in time between the disk array subsystems.

5.7.3 NAS Backup Restore Modular Function

The NAS Backup Restore Modular function protects data that is shared in the NAS Modular system. The NAS Backup Restore Modular function provides the following functions to protect data:

- Snapshot Function
- Backup Restore Function

5.7.4 NAS SyncImage Modular Function

The NAS SyncImage Modular function creates a snapshot which enables data to recover to the state that existed, prior to changes. This data can be recovered even when file system data shared in the NAS Modular system was accidentally changed.

5.8 Performance Management Features and Functions

This feature includes:

- Performance Monitor functions
- Cache Partition Manager functions

5.8.1 Performance Monitor Function

The Performance Monitor acquires information about the performance of RAID groups and logical units, etc. of the subsystem. It also acquires utilization rates of resources such as hard disk drives and processors built in the subsystem. This information is displayed with line graphs in the monitor.

5.8.2 Cache Partition Manager Function

This function is to enhance the performance by cache area division, segment size specification, and assignment for separate LU.

5.9 NAS Features and Functions

The AMS200 and RKNAS combination enables different servers connected via the LAN to share data easily using the NFS/CIFS protocol of the LAN (GbE) interface. The AMS200 supports the following functions:

- NAS Data Control Modular
- NAS File Sharing Modular
- NAS Manager Modular
- NAS Backup Restore Modular Function
- NAS SyncImage Modular Function
- NAS Anti Virus Agent Modular

5.9.1 NAS Data Control Modular Function

The NAS Data Control Modular function provides the basic functions of NAS system.

5.9.2 NAS File Sharing Modular Function

The NAS File Sharing Modular function provides the operating system function of NAS system.

5.9.3 NAS Manager Modular Function

The NAS Manager Modular function provides the setup, operation and management functions for the NAS system.

5.9.4 NAS Backup Restore Modular Function

Refer to section 5.7.3 NAS Backup Restore Modular Function.

5.9.5 NAS SyncImage Modular Function

Refer to section 5.7.4 NAS SyncImage Modular Function.

5.9.6 NAS Anti-Virus Agent Modular Function

The NAS Anti-Virus Agent Modular function provides the NAS system with virus scan functions such as scan server registration, scan condition setting, and virus scan function start/stop.

5.10 iSCSI Features and Functions

1 Gbps iSCSI is supported by adding iSCSI interface to the AMS200. The AMS200 supports the following functions:

- CHAP Authentication
- iSNS Client

5.10.1 CHAP Authentication

User authtnetication is performed for each target.

5.10.2 iSNS Client

The iSNS client function enables you to use iSCSI device discovery, state change notification on the network easily.

Chapter 6 Configuring the AMS200 Subsystem

This chapter includes the following:

- Overview of Configuration
- Configuring the LAN Interface of the AMS200 Subsystem
- Configuring the AMS200 Subsystem
- Registering the AMS200 Subsystem for Control by Storage Navigator-Modular
- Configuring the AMS200 Subsystem for the Desired Application
- General Configuration of the AMS200 Subsystem

This chapter provides information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide an explanation for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
6.1	6.1.1 Open Systems Configuration	○	–	○
	6.1.2 Defining LUNs	○	○	○
	6.1.3 Fibre Channel Interface Addressing	○	–	○
	6.1.4 iSCSI Interface Addressing	–	–	○
	6.1.5 Alternate Pathing	○	–	○
	6.1.6 NAS Configuration	–	○	–
6.2	Configuring the LAN Interfaces Addressing	○	○	○
6.3	Configuring the AMS 200 Subsystem	○	○	○
6.4	Registering the AMS 200 Subsystem for Control by Storage Navigator – Modular	○	○	○
6.5	Configuring the AMS 200 Subsystem for the Desired Application	○	○	○
6.6	General Configuration of the AMS 200 Subsystem	○	○	○

○: The explanation is provided.
—: The explanation is not provided.

6.1 Overview of Configuration

This section includes the following information on configuration:

- Open Systems Configuration
- Defining LUNs
- Fibre Channel Interface Addressing
- iSCSI Interface Addressing
- Alternate Pathing
- NAS Configuration

6.1.1 Open Systems Configuration

- Fibre Channel

The AMS200 subsystem uses the HP 9000 series, Sun Fire™ series, Sun Enterprise™ series, RS/6000™ Family, and each vendor PC (HP-UX, Solaris, AIX IRIX tru64, Linux, Windows 2000, Windows 2003) as a supported platform. For each open system, installation is required.

- iSCSI

The AMS200 uses Linux, Windows2003, Windows XP as a supported platform. For each open system, installation is required.

6.1.2 Defining LUNs

The Storage Navigator Modular software enables the user to define the LUN mapping for each device and reconfigure the mapping at any time. For further information on Storage Navigator Modular, please refer to the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Graphical User Interface (GUI) User's Guide* to use a GUI interface. See the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Command Line Interface (CLI)* to use the CLI version.

6.1.3 Fibre Channel Interface Addressing

One Fibre Channel port is assigned a target ID by addressing port ID. The AMS200 can address up to 256 logical unit numbers for one port. Host computer accesses to the logical unit with the required logical unit number by identifying the port of disk array subsystem using target ID. The following figure illustrates fibre channel port addressing and logical unit number assignment.

6.1.3.1 When the FC Interface Board is Not Added

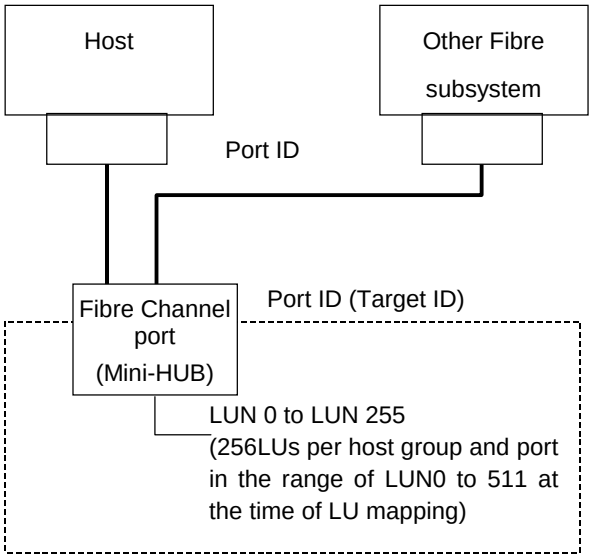


Figure 6.1 Fibre Channel Port-to-LUN Addressing (When the FC Interface Board is Not Added)

6.1.3.2 When the FC Interface Board is Added

The AMS200 host interface implements two ports and two host connectors. One Fibre Channel port configures the FC interface independent of another Fibre Channel port, and implements one host connector.

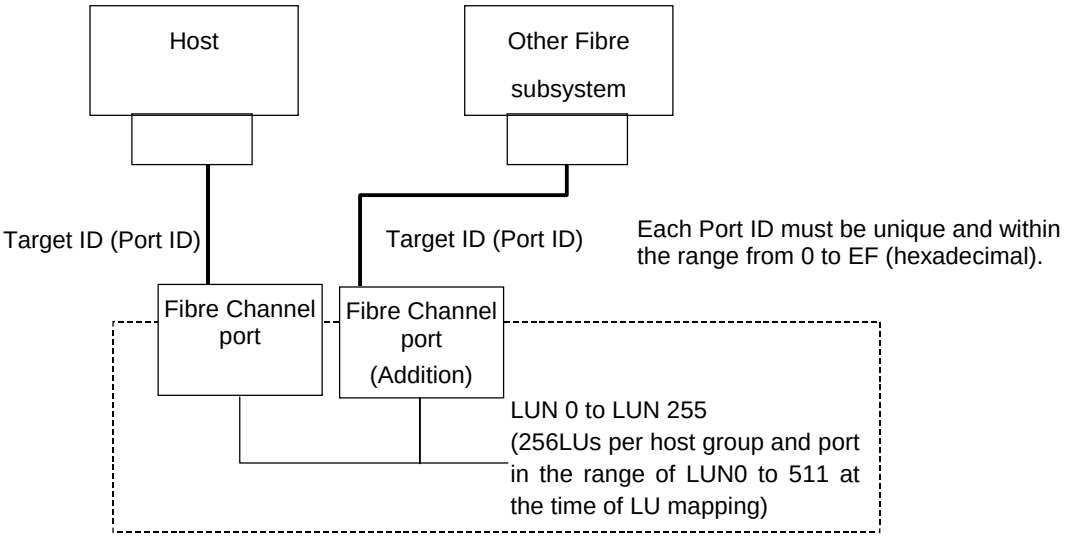

Host
Other Fibre subsystem
Target ID (Port ID)
Target ID (Port ID)
Each Port ID must be unique and within the range from 0 to EF (hexadecimal).
Fibre Channel port
Fibre Channel port (Addition)
LUN 0 to LUN 255
(256LUs per host group and port in the range of LUN0 to 511 at the time of LU mapping)

Figure 6.2 Fibre Channel Port-to-LUN Addressing (When the FC Interface Board is Added)

6.1.4 iSCSI Interface Addressing

The AMS200 supports 4 iSCSI ports by adding iSCSI interface board. The iSCSI port is assigned a target ID by addressing port ID. The AMS200 can address up to 256 logical unit numbers for one port. Host computer accesses to the logical unit with the required logical unit number by identifying the port of disk array subsystem using target ID. The following figure illustrates iSCSI port addressing and logical unit number assignment.

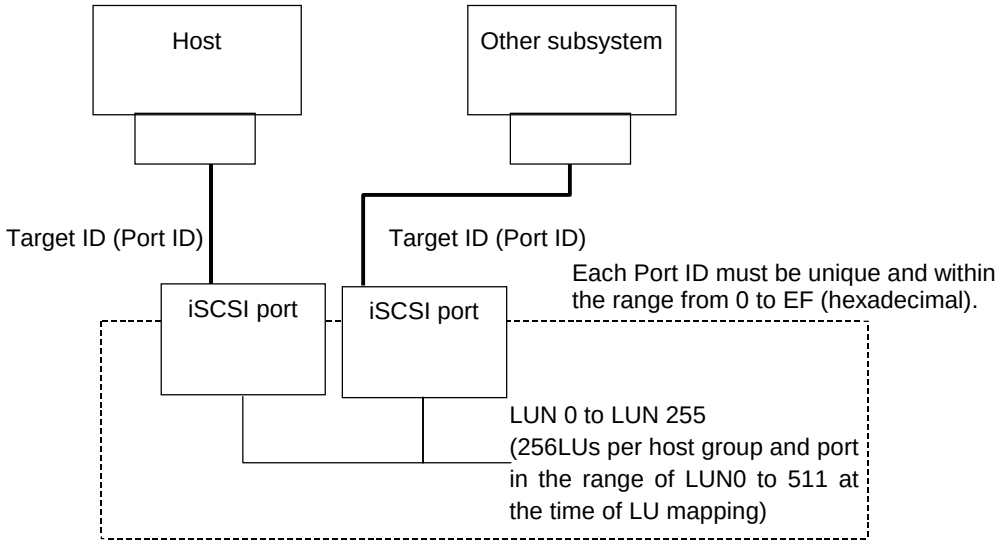

Host
Other subsystem
Target ID (Port ID)
Target ID (Port ID)
Each Port ID must be unique and within the range from 0 to EF (hexadecimal).
iSCSI port
iSCSI port
LUN 0 to LUN 255
(256LUs per host group and port in the range of LUN0 to 511 at the time of LU mapping)

Figure 6.3 iSCSI Port-to-LUN Addressing (When iSCSI interface board is installed)

6.1.5 Alternate Pathing

The user should plan for alternate pathing to ensure the highest data availability. The AMS200 provides up to 2 fibre channel ports or to accommodate alternate pathing for host attachment. The following figure shows a sample of alternate pathing.

6.1.5.1 When the FC Interface Board is Not Added to the Control Unit

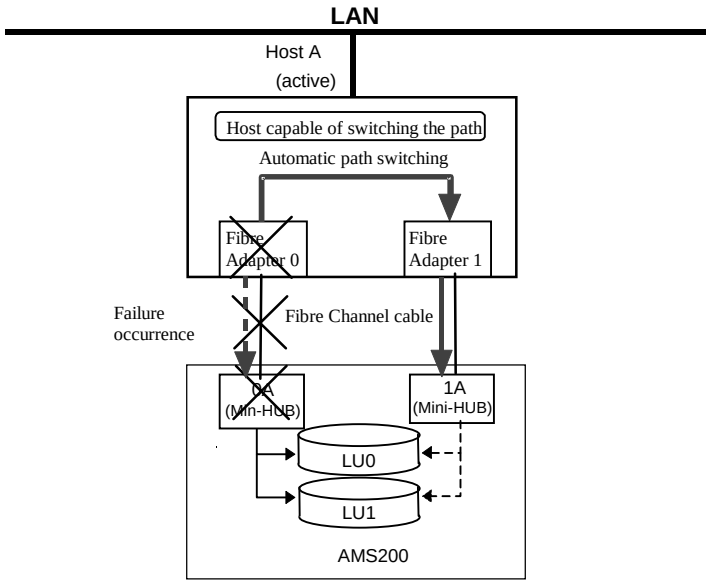


Figure 6.4 Alternate Pathing (When the FC Interface board is not added)

6.1.5.2 When the FC Interface Board is Added to the Control Unit

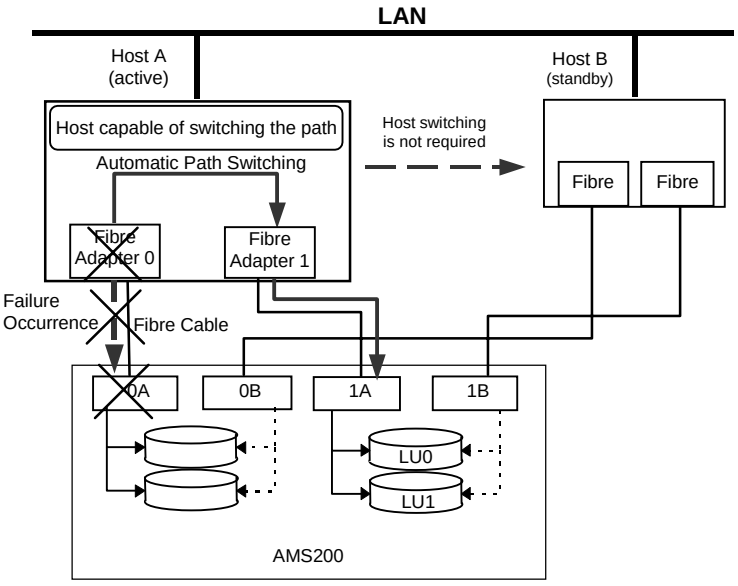


Figure 6.5 Alternate Pathing (When the FC Interface board is added)

6.1.5.3 When the iSCSI Interface Board is Added to the Control Unit

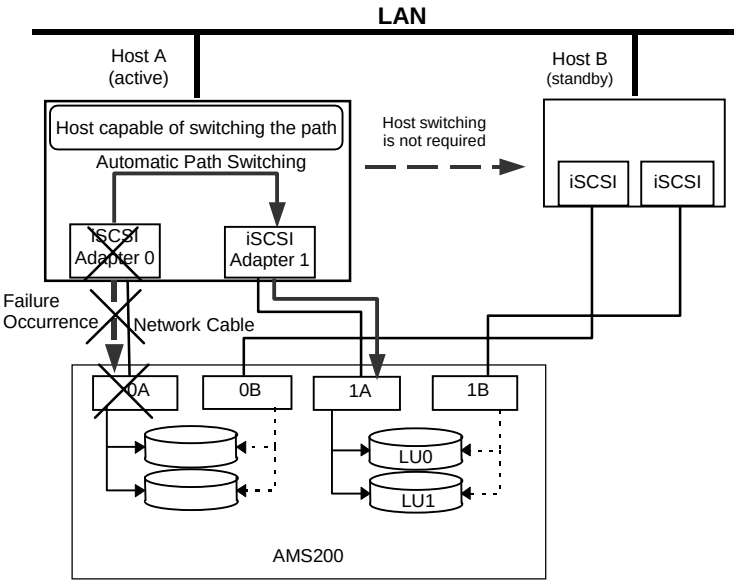


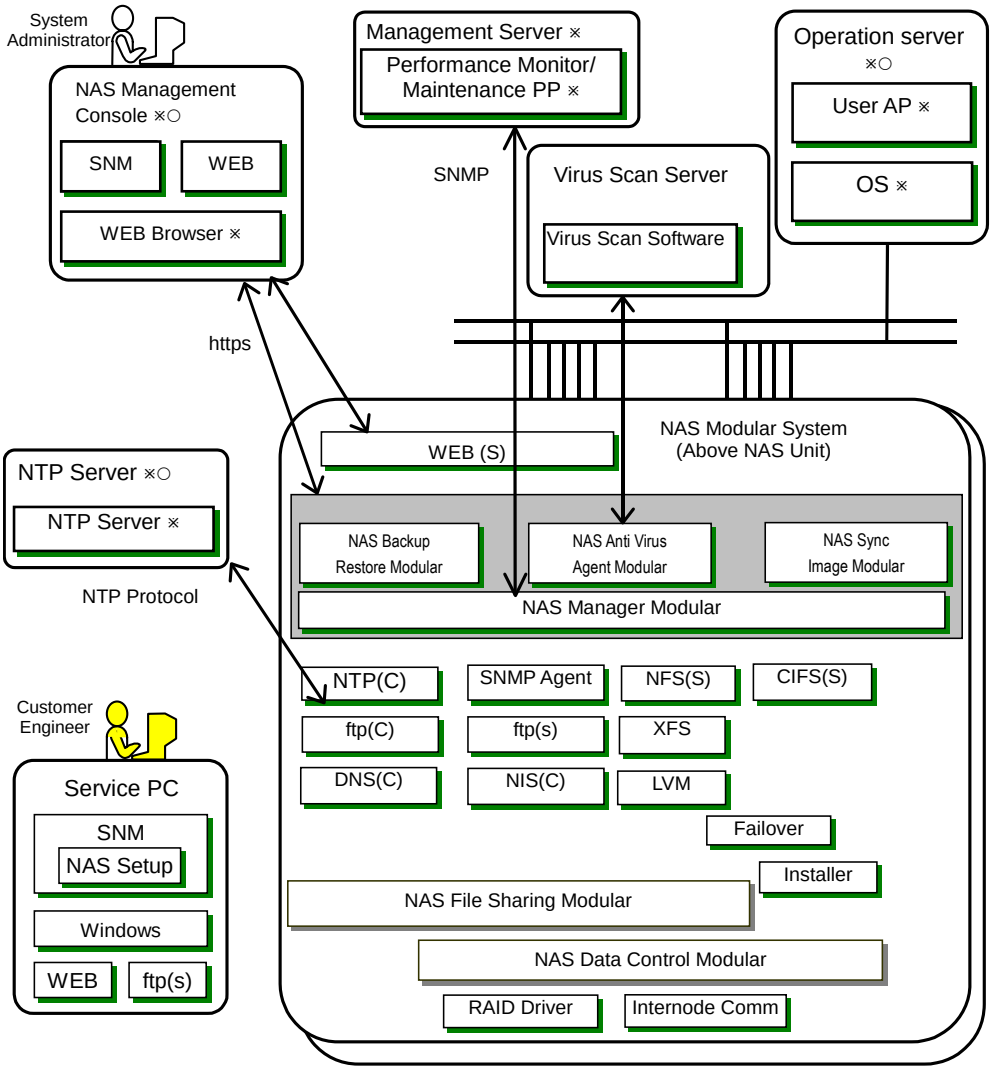
Figure 6.6 Alternate Pathing (When the iSCSI Interface board is added)

6.1.6 NAS Configuration

NAS Modular system operation management software includes management software on the PC (Storage Navigator Modular, NAS Setup, and WEB browser) and NAS Manager Modular.

Operation management (NAS OS, disk array subsystem) on the disk array side from the NAS OS (NAS File Sharing Modular, NAS Data Control Modular) is performed by maintenance software on the PC. Operation management on the host side from the NAS OS (file system, fail-over function) is performed by NAS Manager Modular.

The system administrator gives instructions to the NAS Manager Modular using the WEB browser from the NAS management console. The NAS Manager Modular, which receives the instruction, performs the instructions coordinating with NAS OS or various software.



6.2 Configuring LAN Interfaces of the AMS200 Subsystem

The negotiation mode (10M/100M/half-duplex/full-duplex) of LAN port for user management (used for Hi-Command, Storage Navigator Modular, etc.)and for maintenance of the control Unit supports auto negotiation mode only. Therefore, connect the control Unit to the network device which supports auto negotiation mode and set the auto negotiation mode for the network card and the network switch connected to the control Unit.

Note: If the fixed transfer rate is set for the destination device of the control Unit, the throughput or response performance of network communication may decrease and the control Unit may not communicate the destination device across a network.
The communication mode of the control Unit becomes half-duplex under the Ethernet standard, if the destination device of the control Unit is set to fixed transfer rate. If the communication mode of the destination device of the control Unit is set to a fixed transfer rate, the communication mode does not match between the control Unit and its destination device; the network communication becomes unstable.

Each controller is shipped with a default IP address of 192.168.0.16 (Controller 0) and 192.168.0.17(Controller1), and a netmask of 255.255.255.0. The IP address can be set using the Storage Navigator-Modular program.

If the Storage Navigator-Modular program is used to configure the IP addresses, also refer to the procedure in section 7.10.

If you wish to use Storage Navigator Modular to configure the IP addresses, please refer to the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Graphical User Interface (GUI) User's Guide* to use a GUI interface. See the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Command Line Interface (CLI)* to use the CLI version.

6.3 Configuring the AMS200 Subsystem

The following steps must be performed to configure the disk array:

1. Verify that the subsystem is connected to the LAN.
2. Install Storage Navigator-Modular on the system that will be used as the management PC/Server.

   See the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Graphical User Interface (GUI) User's Guide* to use a GUI interface. See the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Command Line Interface (CLI)* to use the CLI version.

   Refer to the section titled, **Installing Storage Navigator-Modular** for instructions on how to install the program.
3. Register the disk array for control by Storage Navigator-Modular.
4. Set the system parameters using the appropriate installation guide for the desired host platform(s).
5. Reboot the disk array to complete the configuration.

Note: If the setting operation is performed for the array unit connected to the NAS unit, the cluster between the NAS Units stops. When the setting operation for the array subsystem is unavoidably performed, execute it after stopping the cluster between the NAS Units and stopping the NAS OS of both NAS Units. Start the cluster between the NAS Units again after completing the setting operation for the array subsystem.

6.4 Registering the AMS200 Subsystem for Control by Storage Navigator-Modular

To operate the array unit from Storage Navigator-Modular, register the array unit. You cannot temporarily register a non-existing array unit:

1. From the **Edit** menu, click **Add Automatically**.
2. On the **Add Array Unit Automatically** dialog box, enter the IP address for the **From:** and **To:** boxes of the **IP Addresses to Search** of **Search Array Unit**. Click **Start**.
3. The result of the search displays.

   Select the name that you want to register, and click the ▲ button.
   The selected array unit is moved from the **Search Results** list to the **Array Units to Add** list.
4. Click **OK**.
5. A message displays requesting confirmation to add the subsystems. Click **OK**.
6. The **Result** screen displays. Click **Close**.

6.5 Configuring the AMS200 Subsystem for the Desired Application

Before configuring the AMS200 make sure that you know the following:

- The required RAID level, based on performance and pricing criteria.
- The number and size of LUNs you wish to create.
- The controller path you wish to use to access the data on the LUNs.
- If there are any special options that need to be set that are specific to the host platform(s) being used. These will be detailed in the Host Installation Manual for the host platform being used.

6.6 AMS200 Subsystem General Configuration

Activating Management mode in Storage Navigator-Modular will enable you to do a general configuration of the AMS200 subsystem. Before it is possible to configure the AMS200, management mode must be enabled in Storage Navigator-Modular. Otherwise, it is only possible to monitor the status of the AMS200.

To enable Management Mode:

1. From the **Tools** menu, click **Operation Mode**, and then click **Set Password** on the Main screen.
2. Enter **Old Password**, **New Password** and **New Password** (for confirmation) and click **OK**.

   Specify a password of up to 12 alphanumeric characters.
3. On the **Tools** menu, select **Operation Mode,** and then click **Change**. Alternatively, click **Change Mode** on the toolbar.
4. When the **password-input** screen displays, enter a password and click **OK**. **Management Mode** displays in **Operation Mode** in the upper part of the Main screen. The Storage Navigator-Modular program operates in **Management Mode**.

Chapter 7 Configuring Storage on the AMS200 Subsystem

The process of configuring storage on the AMS200 subsystem involves the following sub-processes:

- Software Composition
- Setting Fibre Channel Information
- Setting iSCSI Information
- Determining Space and RAID Level Requirements
- Setting Host Group Information
- Setting Target Information
- Setting CHAP Authentication Information
- Transferring Configurations from One Array to Another
- Storing Configuration Data
- Applying Configuration Data to an Additional AMS200 Subsystem
- Setting Host Connection Parameters
- Setting the Subsystem when Using Special Mode
- Changing the Network Parameter
- Changing the Address for the Maintenance Port
- Setting the System LU and User LU in the NAS System
- Setting the NNC Management LAN Port Information in the NAS System
- Setting the Time Zone

This chapter provides information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide an explanation for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
7.1	7.1.1 Microprogram	○	○	○
	7.1.2 System Parameters	○	○	○
	7.1.3 Configuration Information	○	○	○
	7.1.4 SNMP Information	○	○	○
	7.1.5 Storage for Parameters	○	○	○
7.2	Setting Fibre Channel Information	○	–	–
7.3	Setting iSCSI	–	–	○
7.4	7.4.1 Setting a Spare Disk	○	○	○
	7.4.2 Canceling a Spare Disk Setting	○	○	○
	7.4.3 Setting a RAID Group	○	○	○
	7.4.4 Deleting a RAID Group	○	○	○
	7.4.5 Setting a Logical Unit	○	○	○
	7.4.6 Deleting the Last Logical Unit	○	○	○
	7.4.7 Formatting a Logical Unit	○	○	○
	7.4.8 Changing the Format Mode	○	○	○
	7.4.9 Changing the Default Controller in Charge of an LU	○	○	○
7.5	7.5.1 Setting Mapping Information	○	–	–
7.6	7.6.1 Setting Mapping Information	–	–	○
7.7	Setting CHAP authentication information	–	–	○
7.8	Transferring Configuration	○	○	○
7.9	Storing Configuration Data	○	○	○
7.10	Applying Configuration Data to Another AMS 200 Subsystem	○	○	○
7.11	7.11.1 Simple Setting	○	–	○
	7.11.2 Detailed Setting for Each Host Connection	○	–	○
7.12	Setting the Subsystem When Using Special Mode	○	○	○
7.13	Changing the Network Parameter	○	○	○
7.14	Changing the IP Address for the Maintenance Port	○	○	○
7.15	Setting the System LU and User LU in the NAS System	–	○	–
7.16	Setting the NNC Management LAN Port Information in the NAS System	–	○	–
7.17	Setting Time Zone	○	○	○

○: The explanation is provided.
—: The explanation is not provided.

7.1 Software Composition

This section includes the following:

- Microprogram
- System parameters
- Configuration information
- SNMP information
- Storage for parameters

7.1.1 Microprogram

A microprogram controls basic hardware operations which accompany the execution of given instructions performed by a CPU. The version of the microprogram is controlled by the following numerical format: **xxxxx/xx**.

The microprogram **07xxx/xx** (**x** is optional), is available. However, **/x** may not be included in the microprogram version number or another control system may control the microprograms.

NAS model has NAS OS and BIOS. NAS OS controls file service and NAS management function. The version is managed by the following numerical format: xx-xx-xx (x is optional).
BIOS controls RKNAS initialization and NAS unit full memory dump (hereinafter referred to as NAS dump) collection function. The version is managed by the following numerical format: xxxxxxxx (x is optional).

7.1.2 System Parameters

System parameters are necessary to start the subsystem (from turning on the main switch of RKS to generation of the RDY LED (green) of RKS. System parameters are stored in flash memory. They can be backed up to a disk drive. When the system parameter changes, make a backup copy on the disk drive.

7.1.3 Configuration Information

The configuration information is a record of customer data on the subsystem, such as the RAID configuration and LU capacity. The configuration information exists in the disk drive when the main switch is turned off; it is transmitted onto the main memory of the controller when the main switch is turned on. When configuration information is changed, the information on the disk drive is updated simultaneously.

7.1.4 SNMP Information

The SNMP parameter enables the SNMP function to operate effectively. When SNMP information activates the SNMP function, the template contained in the SNMP information (in the SNMP directory on the provided CD-R) is edited and registered in the subsystem.

7.1.5 Storage for Parameters

The storage areas where the parameters on the controller are stored are described in the following table:

Table 7.1 Storage for Parameters

No.	Parameter	Storage	Description
1	Fixed Part Program Flash Program System Parameters	Flash Memory (and backup FD)	The parameters are stored in flash memory. No provision of storage against a power shut off is required for the parameters because flash memory can retain information when power is shut off. Parameters can be backed up to the following: ▪ Fixed part program: N/A. ▪ Flash program: Automatically backed up to the system area. ▪ System parameters: Automatically backed up to the disk drive.
2	Microprogram Configuration Information SNMP Information	Disk Drive (System Area)	Generally, information in a RAM is erased when the main switch is turned off. Therefore, the subsystem also stores the parameters used on the RAM on the disk drive. (An area is reserved in the disk drive to store them. This area is called the system area.) The system area is provided on the disk drives #0 to #4 in the RKS frame. Therefore, the system area has redundancy for disk drives #0 to #4 in the RKS frame.

7.2 Setting Fibre Channel Information

Follow the steps below to set and display fibre channel information:

The Fibre Channel information setting is performed in Management mode of the Storage Navigator Modular. Therefore, the operation mode of Storage Navigator Modular needs to be switched from Normal mode to Management Mode. (Refer to section 6.6.) In Normal mode, you can only monitor the status of AMS200, but you cannot change the settings.

CAUTION

Back up all data before performing this procedure. (If a mistake in operation is made, user data in the subsystem can be lost.)

Note: Depending on the Fibre Channel interface cable connection pattern, the setting value needs to be considered. Refer to section 4.3.2.

1. Turn on the power supply.

Note: If the power supply has already been turned on, proceed to the next step.

2. Start the Storage Navigator-Modular program and set the operation mode in **Management Mode**.
3. Click the icon of an array unit on the Main window and select the **Settings** menu. Click **Display Details** or click **Display Details** on the toolbar.
4. On the **Tools** menu, click **Configuration Settings** or click the **Configuration Settings** button on the toolbar.
5. Click the **Fibre Channel** tab.
6. Set a **Port Address**, **Topology Information**, and **Transfer Rate**:

   Port Address: Port address is displayed as a hexadecimal number.

   Topology Information: Indicates the topology status.

   Transfer Rate: Select 1 Gbps, 2 Gbps, 4 Gbps (at the time of adding FC interface board) or Auto.
7. Make the setting for the other ports in the same way as step 6.
8. Click **Apply**.
9. A confirmation message displays. After verifying that the I/O operation initiated by the host has stopped, click **OK**.
10. A message displays stating the setting is completed. Click **OK**.

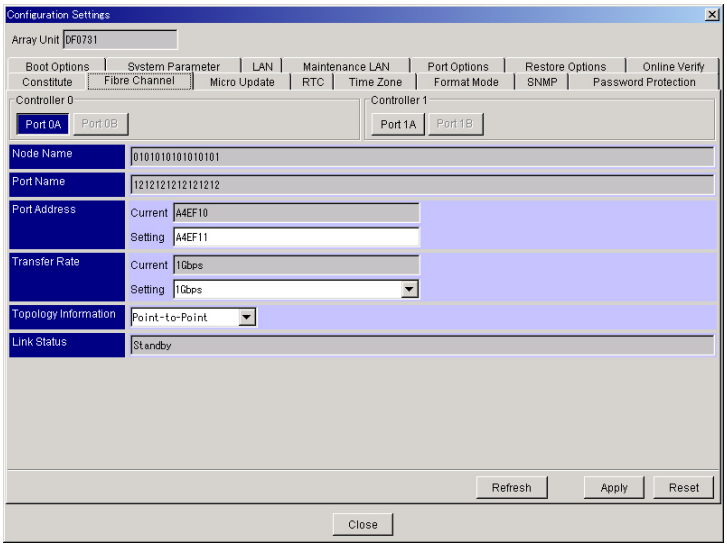


Figure 7.1 Fibre Channel Setting

7.3 Setting iSCSI Information

7.3.1 Setting iSCSI Port Information

To set iSCSI port information, follow these steps:

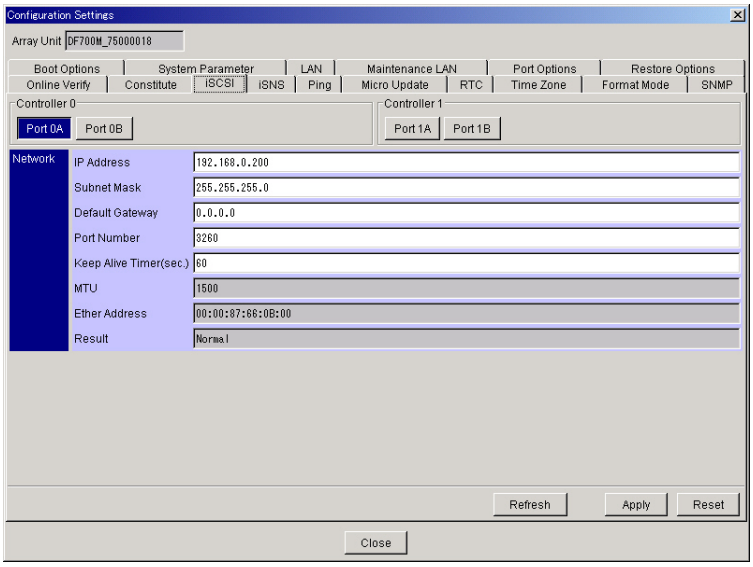
CAUTION

Back up all data before performing this procedure. (If a mistake in operation is made, user data in the subsystem can be lost.)

1. Turn on the power supply.

Note: If the power supply has already been turned on, proceed to the next step.

2. Start the Storage Navigator - Modular program and set the operation mode in **Management Mode**.
3. Click the icon of an array unit on the Main window and select the **Settings** menu. Click **Display Details** or click the **Display Details** button on the toolbar.
4. On the **Tools** menu, click **Configuration Settings** or click the **Configuration Settings** button on the toolbar.
5. Click the **iSCSI** tab.



6. Set a **IP Address**, **Subnet Mask**, **Default Gateway**, **Port Number**, and **Keep Alive Timer(sec.)**.

   IP Address: Specify IP address.

   Subnet Mask: Specify subnet mask.

   Default Gateway: Specify default gateway address.

   Port Number: Specify port number. The default is 3260.

   Keep Alive Timer(sec.): Specify Keep Alive Timer. The default is 60 seconds.

7. Make the setting for the other ports in the same way as step 6.

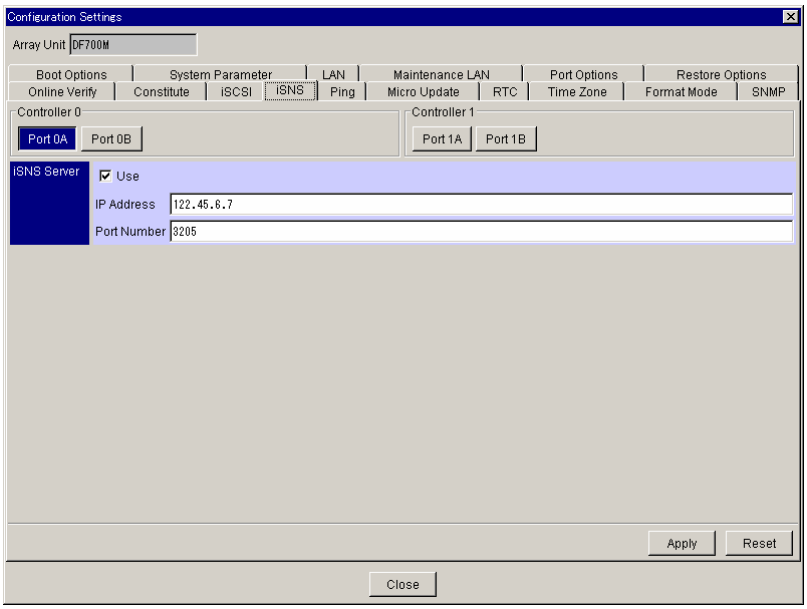
8. Click the **Apply** button.
9. A confirmation message appears. After verifying that the I/O operation initiated by the host has stopped, click the **OK** button.
10. A message appears, stating that the setting is completed. Click the **OK** button.

7.3.2 Setting the iSNS Server Information

iSNS (Internet Storage Name Service) provides the same function as the Name Server of the Fabric Switch on the Fibre Channel interface.

The disk array subsystem registers the iSCSI port information on the iSNS Server. The host as iSCSI initiator discovers the iSCSI target with iSCSI disk array subsystem information registered on the iSNS Server.

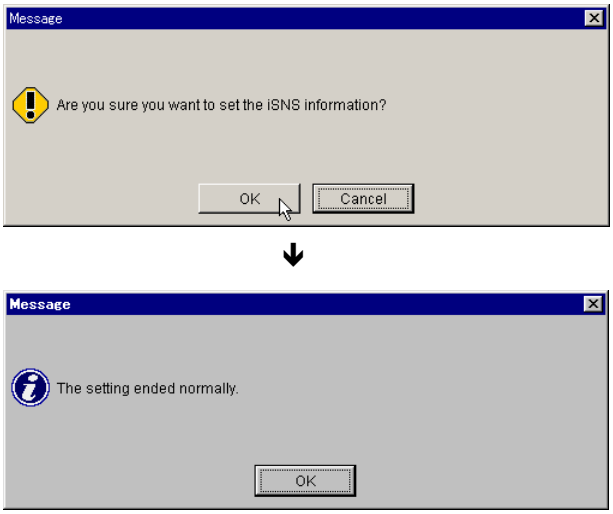
1. On the **Tools** menu, click **Configuration Settings** or click the **Configuration Settings** button on the toolbar.
2. Click the **iSNS** tab.



– **iSNS Server:** Specify whether to use iSNS Server or not. When using the iSNS server, specify the **IP Address** and **Port Number** of the iSNS Server.

3. Click the **Apply** button.

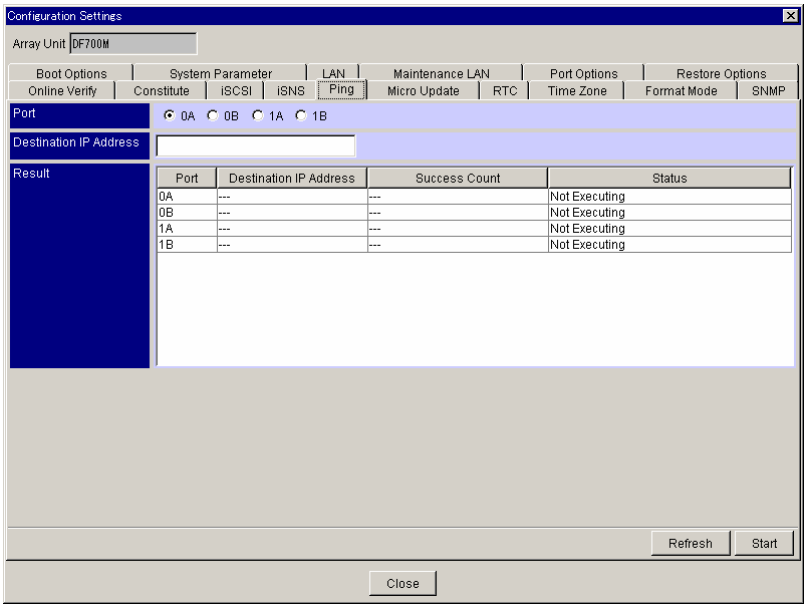
4. A confirmation message is displayed. Click the **OK** button.



7.3.3 Sending a Ping

To send the ping to the initiator (host) and display the result of the sending, follow these steps:

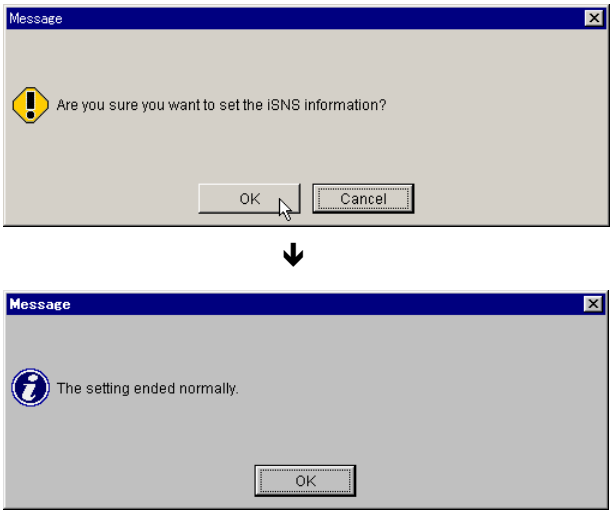
1. On the **Tools** menu, click the **Configuration Settings** or click the **Configuration Settings** button on the toolbar.
2. Click the **Ping** tab.



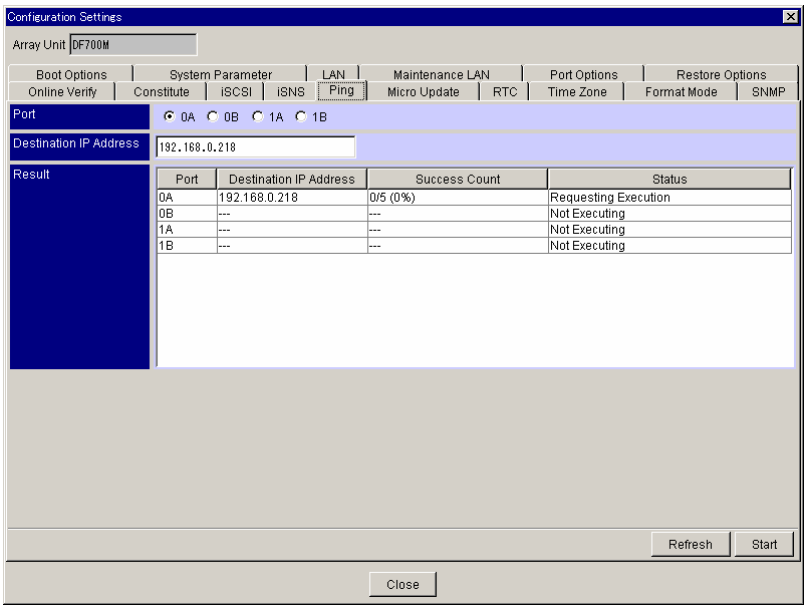
- **Port:** Select the port to send ping.
- **Destination IP Address:** Specifiy the IP Address of the initiator.

3. Click the **Start** button.

4. The The following message appears. Click the **OK** button.



The result is displayed.



5. As necessary, select the **Refresh** button to display the latest information.

7.4 Determining Space and RAID Level Requirements

This process will depend on the customer requirements, however Acer | HDS recommends certain configuration guidelines that will provide good performance and adequate protection of data integrity in most circumstances.

This function can be used in the device ready state (Read/Write cannot be executed from the host in operation. When a host command is received, Not Ready is reported to the host computer).

This section includes:

- Setting a spare disk
- Canceling a spare disk setting
- Setting a RAID group
- Deleting a RAID group
- Setting a Logical unit
- Deleting the last logical unit
- Formatting a logical unit
- Change of the controller in charge of a default LU

7.4.1 Setting a Spare Disk

To set a spare disk, follow these steps:

1. Turn on the power supply.

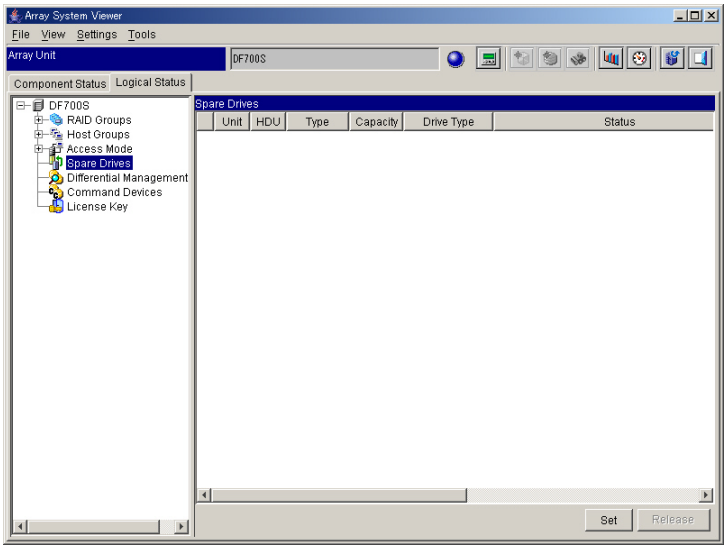
   Note: If the power supply has been turned on, proceed to the next step.

2. Start the Storage Navigator-Modular program, and set the operation mode to **Management Mode**.

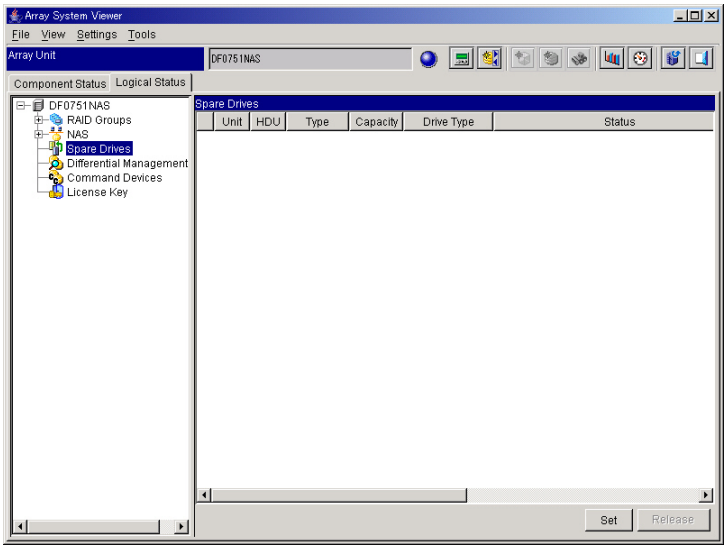
3. Double-click the **icon** of an array unit in the Main window. Once the array unit information displays, select the **Settings** menu.

4. On the **Settings** menu, select **Display Details** or click **Display Details** on the toolbar.

5. Click the **Logical Status** tab on the Unit Window:

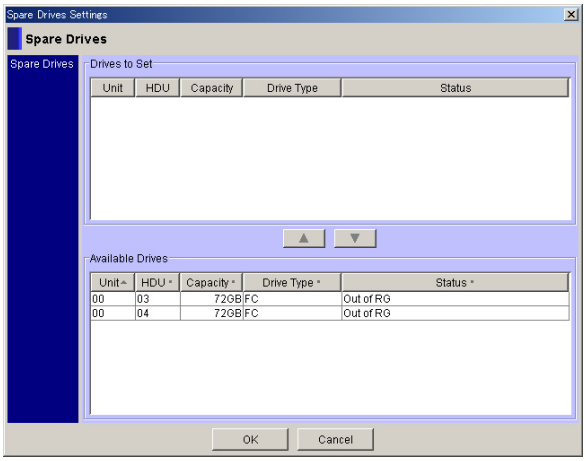


(NAS)



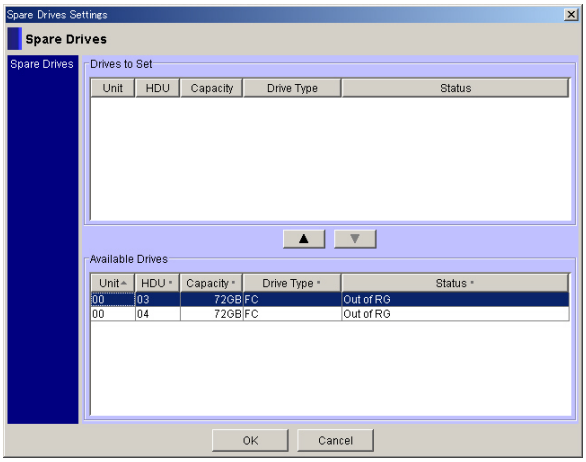
6. Double-click the **Spare Drives** icon.

7. Click **Set**. The **Spare Drives** dialog box displays:



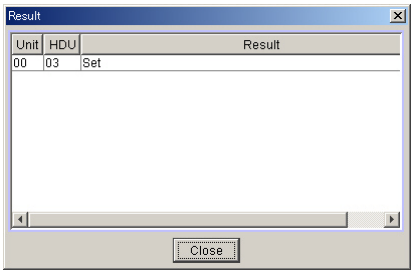
8. Select the HDU that you want to set as a spare drive from the **Available Drives** list and click the ▲ button.

   The selected HDU is moved to the **Drives to Set** list:

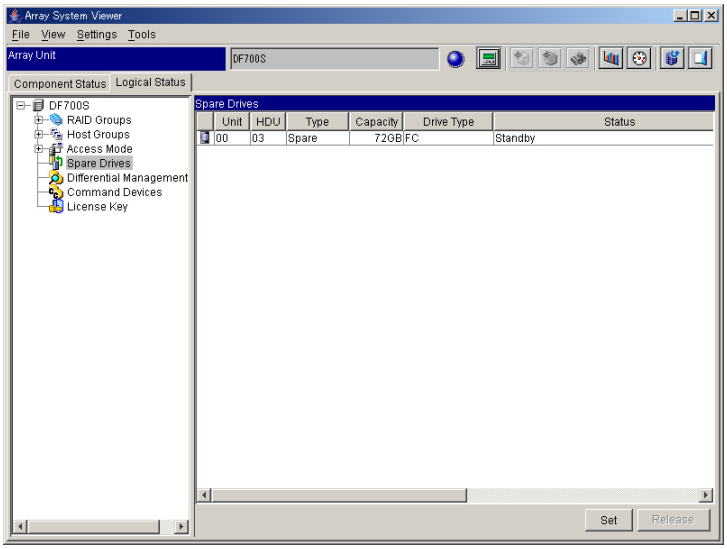


9. Click **OK**.
10. A message indicating that the setting is complete displays. Click **OK**.

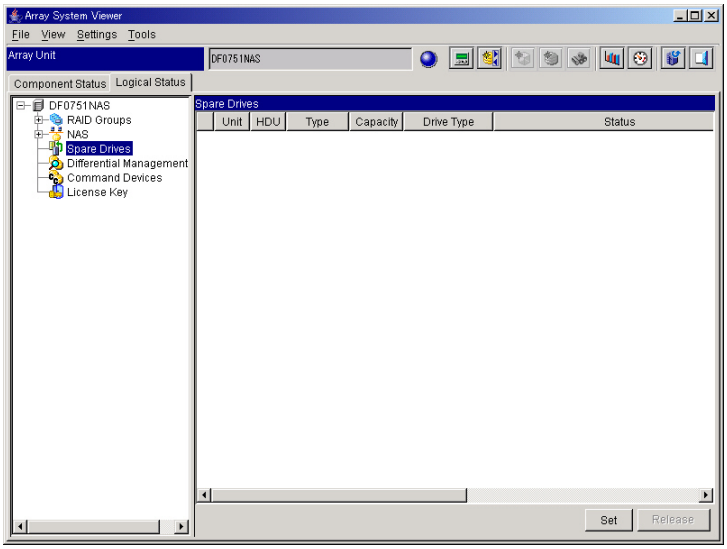
11. A **Result** window displays indicating the setting is completed. Click **Close:**



The spare drive setting is updated and the following window displays:



(NAS)



7.4.2 Canceling a Spare Disk Setting

To cancel a spare disk setting:

1. Select the **Logical Unit** tab on the Unit window.
2. Select the **Spare Drives**.
3. Select the spare drive to be canceled, and then click **Release**.
4. The confirmation message for spare drive canceled displays. Click **OK**.
5. A message displays stating the setting is complete. Click **Close**.

7.4.3 Setting a RAID Group

Note: It is recommended that you set at least four RAID Groups for the RAID group used when the NAS unit is connected. This sets the NAS system LU for the usual operation, the NAS system LU for backup, and the NAS user LU into another RAID Group.

To set a RAID group, follow these steps:

1. Turn on the power supply.

   Note: If the power supply has been turned on, proceed to the next step.

2. Start the Storage Navigator-Modular program, and set the operation mode to **Management Mode**.

3. Click the icon of an array unit on the Main window, select the **Settings** menu, and then click **Display Details**. Alternately, click **Display Details** on the tool bar.

4. Click the **Logical Status** tab.

5. From the **Settings** menu, select **RAID Group**, and then click **Settings**. Alternatively, click **RAID Group Settings** in the tool bar.
   This operation can also be completed from the context menu of the **RAID Groups** box.

6. On the **RAID Group** dialog, select or enter the **RAID Level**, **Drive Configuration**(**Drive Type**, **Drive Capacity**, **Combination**, and **Parity Groups**), and then click **OK**. For the **Drives**, select **Automatic Selection**.

7. A confirmation message displays. Click **OK**.

8. If the RAID group setting is not successful, delete the affected RAID group, and try creating the RAID group again.

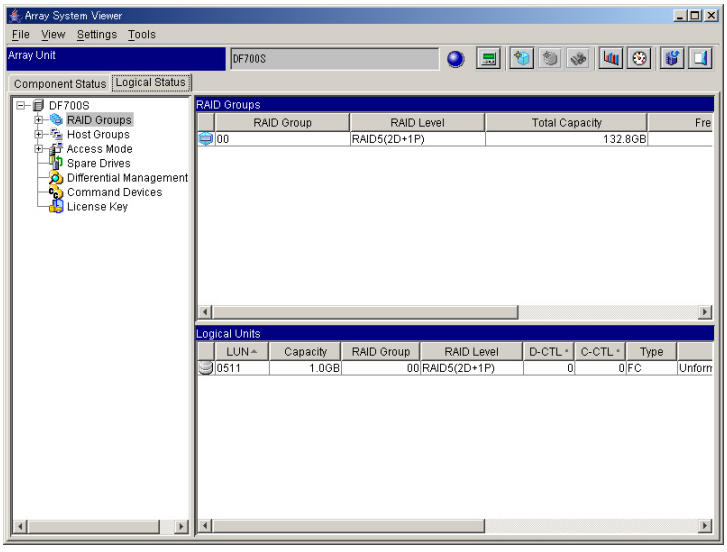


Figure 7.2 Logical Status Tab

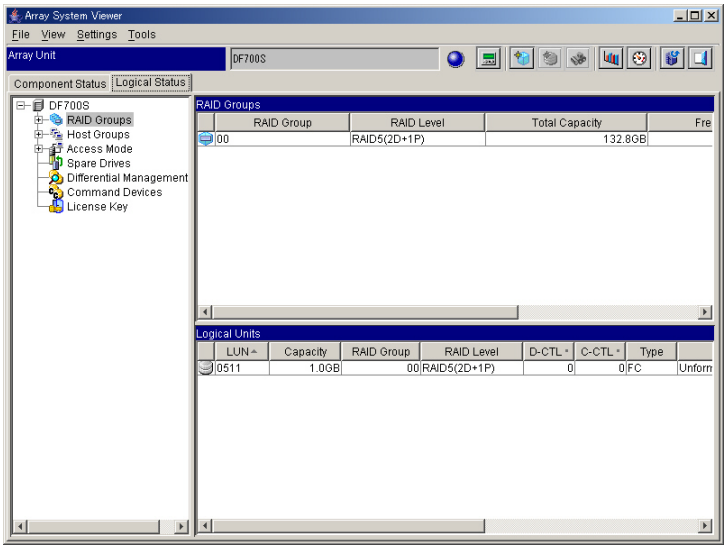


Figure 7.3 Logical Status Tab (NAS)

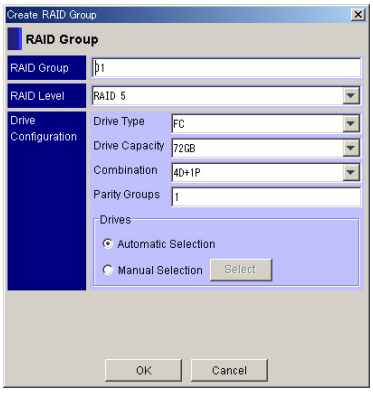


Figure 7.4 RAID Group Dialog Box

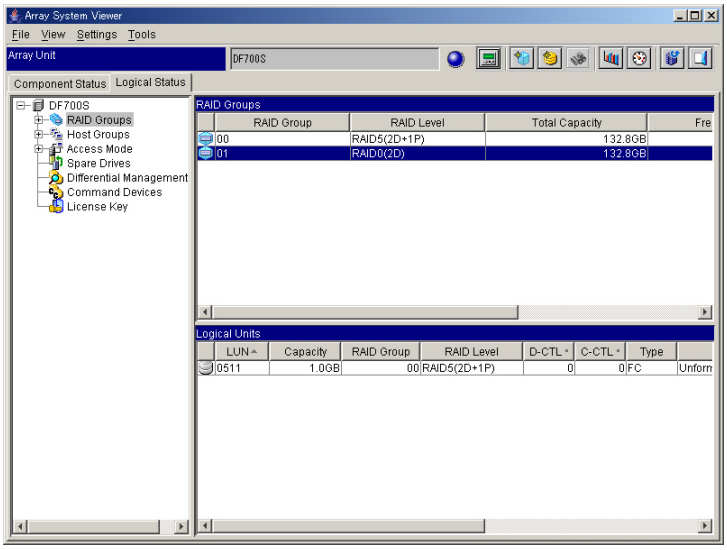


Figure 7.5 RAID Group is Updated

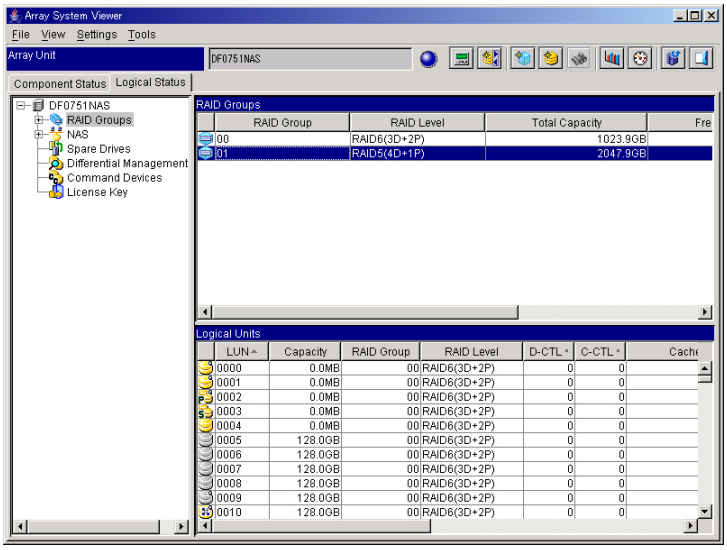


Figure 7.6 RAID Group is Updated (NAS)

7.4.4 Deleting a RAID Group

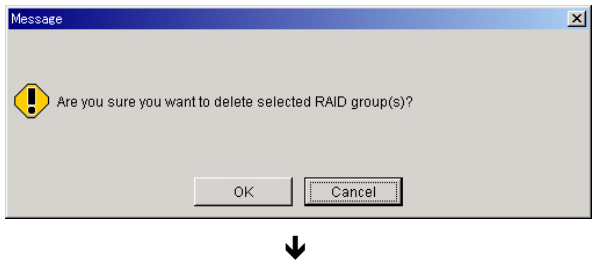
CAUTION

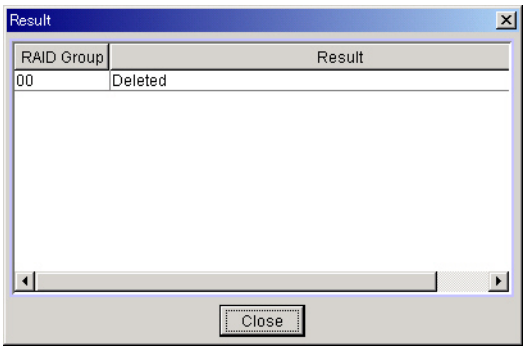
All user data on all LUNs will be lost if all RAID groups are deleted. Back up the user data before performing this operation.

The unified LU cannot be unified or split unless the LU unifying function (a priced option) is validated. When a unified LU is defined, the RAID group cannot be deleted. Delete the RAID group after splitting all the unified LUs in the RAID group. For the procedure for splitting a unified LU, refer to the *LU Unifying Function User's Guide*.

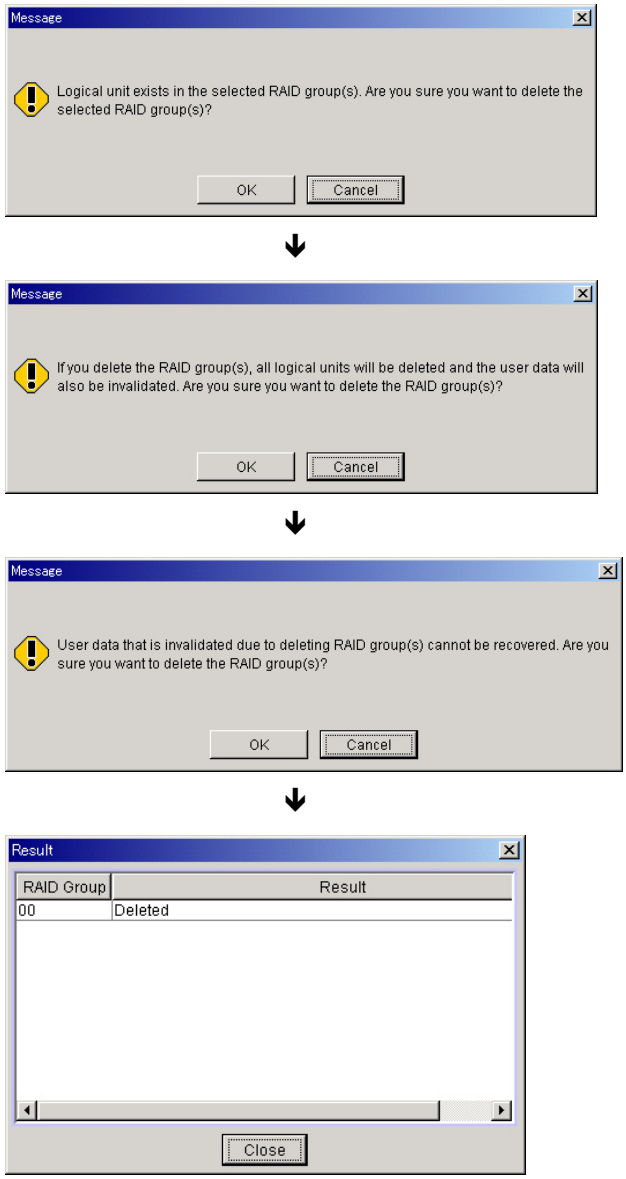
To delete a RAID Group, follow these steps:

1. Click the **Logical Status** tab on the Unit screen.
2. Select the RAID group to be deleted from the **RAID Groups**.
3. From the **Settings** menu, select **RAID Group** and click **Delete**.
4. A message displays requesting confirmation to delete the selected RAID groups. Depending on whether there are formatted logical units in the RAID group or not, the message description is different. Click **OK**.
   - When no logical unit exists in the RAID Group:





When a logical unit exists in the RAID Group:


Message
Logical unit exists in the selected RAID group(s). Are you sure you want to delete the selected RAID group(s)?
OK
Cancel
Message
If you delete the RAID group(s), all logical units will be deleted and the user data will also be invalidated. Are you sure you want to delete the RAID group(s)?
OK
Cancel
Message
User data that is invalidated due to deleting RAID group(s) cannot be recovered. Are you sure you want to delete the RAID group(s)?
OK
Cancel
Result
RAID Group
Result
00
Deleted
Close

7.4.5 Setting a Logical Unit

Note: You can create settings for the only system LU when the AMS200 is connected to the NAS in accordance with the following restrictions:

No.	Internal LU Number (Note1)	System LU	Capacity Restriction		Control unit in charge (Note2)
			Bytes Designation	Block Designation	
1	0	For system disk (CTL 0)	14,013 M bytes (or more)	27,369,141 blocks (or more)	0
2	1	For system disk (CTL 1)	14,013 M bytes (or more)	27,369,141 blocks (or more)	1
3	2	For volume for storing dump (CTL 0)	4,925 M bytes (or more)	9,619,141 blocks (or more)	0
4	3	For volume for storing dump (CTL 1)	4,925 M bytes (or more)	9,619,141 blocks (or more)	1
5	4	For command device	35 M bytes (or more)	68,360 blocks (or more)	0
6	5	For the work for storing the dump edit result.	4,195 M bytes (or more)	8,193,360 blocks (or more)	0
7	6	For the system sharing volume	2,537 M bytes (or more)	4,955,079 blocks (or more)	0
8	7	For the volume for back-upping a shared volume	2,537 M bytes (or more)	4,955,079 blocks (or more)	0
9	8	For the volume 2 for back-upping a shared volume	2,537 M bytes (or more)	4,955,079 blocks (or more)	0

Note1: Internal LU Number is recommended value. If value other than the values described above is set, there is no problem in system operation.

Note2: Control unit in charge is recommended value. If value other than the values described above is set, there is no problem in system operation.

Note: It is recommended that system LU and user LU when the AMS200 is connected to the NAS are created in different RAID groups respectively.

To set a logical unit, follow these steps:

1. Turn on the power supply.

Note: If the power supply has already been turned on, proceed to the next step.

1. Start the Storage Navigator-Modular program, and set the operation mode to **Management Mode**.
2. Click the icon of an array unit on the Main window, select the **Settings** menu, and then click **Display Details**. Alternately, click **Display Details** on the tool bar.
3. Click the **Logical Status** tab on the Unit screen.
4. Click the **icon** of a RAID group from which you would like to create the Logical Unit. On the **Settings** menu, select **Logical Unit** and click **Settings**. Alternately, click **Logical Unit Settings** on the tool bar.

   This operation can also be completed from the context menu of the **Logical Unit** dialog box. The **Logical Unit** dialog box displays.

1. On the **Logical Unit** dialog box, enter or select **Logical Unit No.**, **Default Controller**, and **Size**. Click **OK**.

2. A created logical unit number displays for the **Logical Unit No.** and the RAID group number in which logical units are defined for the **RAID Group**. Additionally, a logical unit capacity that can be created displays.

   Note: To specify a size explicitly in figures, select a unit to specify the size from among the **GB**, **MB**, and **Block**. Specify the size to be allocated in decimal number.
   The subsystem can be divided into a maximum of 2,048 logical units.

   Note: The logical unit number may be set optionally when the logical unit is created. However, the logical unit number 0 is assigned to the logical unit created first.

3. After the setting is complete, click **OK**.

4. The set logical unit information is updated and the window displays.

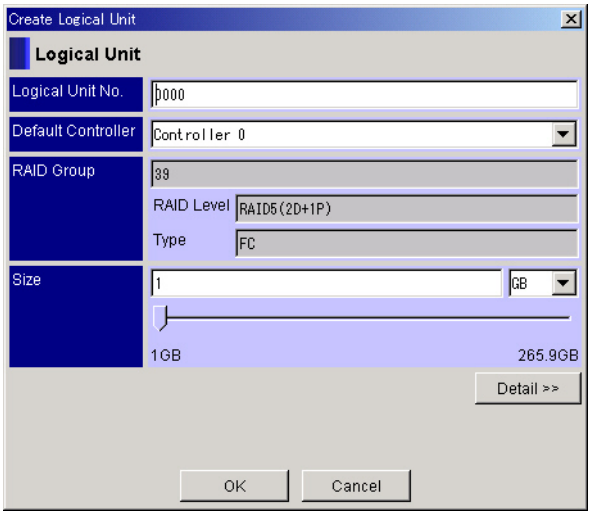


Figure 7.7 Setting the Logical Unit Dialog Box

7.4.6 Deleting the Last Logical Unit

To delete the last logical unit, follow these steps:

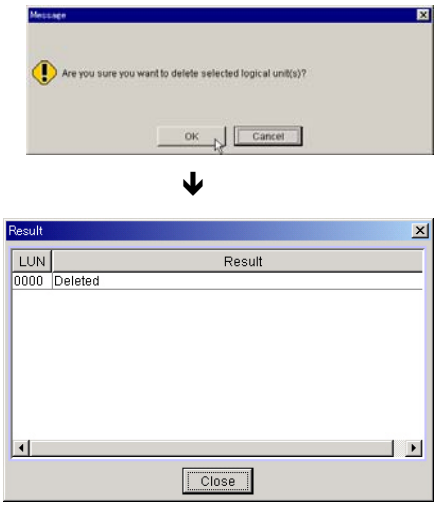
1. Click the **Logical Status** tab on the Unit window.
2. From the Unit window, select the icon of logical unit to be deleted.
3. On the Settings menu, select Logical Unit and click **Delete**.

Note : The logical units being used in the NAS system may be unable to be deleted.

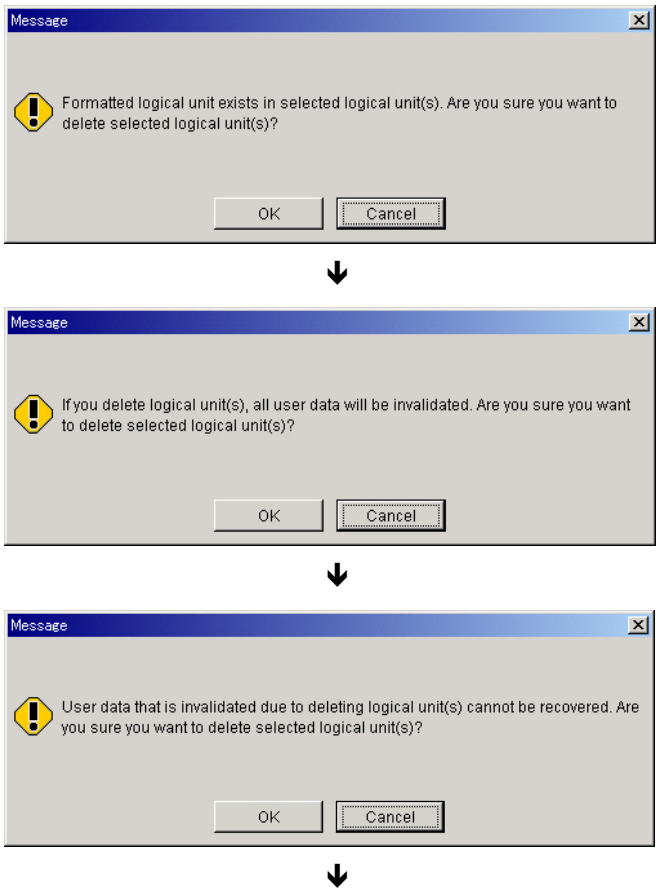
4. A confirmation message displays indicating whether selected logical units should be deleted or not. Depending on whether the logical units to be deleted are formatted or not, the message description is different. Click **OK**.

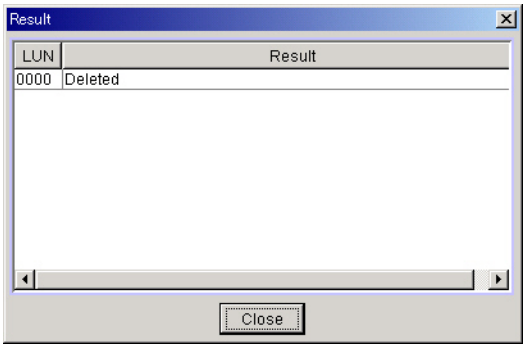
   The logical unit information in which the logical unit has been deleted is updated and the window displays.

When no formatted logical unit exists:



When formatted logical unit exists:


Message
Formatted logical unit exists in selected logical unit(s). Are you sure you want to delete selected logical unit(s)?
OK
Cancel
Message
If you delete logical unit(s), all user data will be invalidated. Are you sure you want to delete selected logical unit(s)?
OK
Cancel
Message
User data that is invalidated due to deleting logical unit(s) cannot be recovered. Are you sure you want to delete selected logical unit(s)?
OK
Cancel



7.4.7 Formatting a Logical Unit

Note 1: For the logical unit that is being formatted in the background, it is best to perform operations to the host installation.

If a volatile failure for data in cache memory occurs due to subsystem power-off during formatting, the logical unit will be unformatted and data can be lost. Therefore, host installation operation should be performed from the first step for the logical unit.

Note 2: When logical units are formatted, the user data will be initialized and completely deleted.

Note 3: The RAID group is allocated to the NAS system LU when the NAS is connected; the user LU cannot be deleted without releasing the allocation.

Note 4: Formatting will impact host access performance, especially on the logical unit being formatted and on the logical unit in the same RAID group as the logical unit being formatted. Perform formatting functions during off-hours with less host access.

When formatting the logical unit in the same RAID group as NAS system LU, do not boot or reboot the NAS OS. This could result in boot failure or increase the boot time of NAS OS.

- **Format**

  This mode enables the subsystem to start its operation earlier by formatting the specified LU in the background to make it usable by a host. Up to 512 LUs can be specified for formatting. This number can also be increased; however, the number of LUs that can be simultaneously formatted in the background is six per CTL. When executing formatting, the Storage Navigator-Modular program can perform operations (such as a RAID group creation) while the formatting is being executed.

  When the Storage Navigator-Modular program is terminated while formatting is executed, the formatting function is continued. When the Storage Navigator-Modular program is terminated while formatting is executed, the formatting progress is displayed by percentage in the logical unit status column when the Storage Navigator-Modular program is activated again.

  When the host I/O is executed for the LU in formatting, Format completion may be delayed; from the 99 % progress status, it may take 400 seconds (maximum).

To format a logical unit, follow these steps:

1. Click the icon of a logical unit in the Unit window. On the Settings menu, select **Logical Unit**, and then click **Format**.

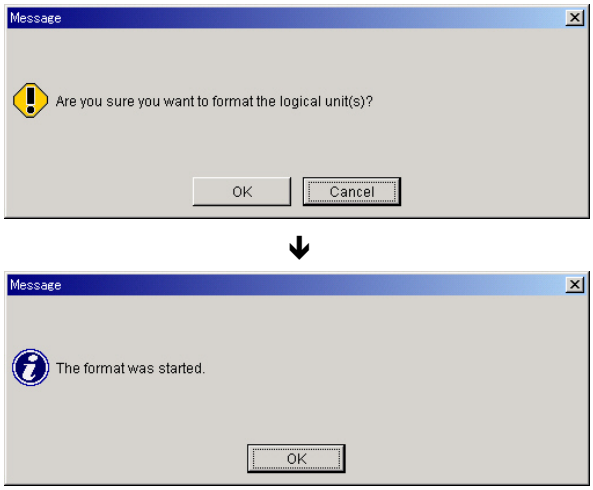
Note 1: When you select multiple logical units, hold down the **Ctrl** key and click the **icons** of the logical units to format.

When a logical unit is incorrectly specified, press the **Cancel** button and redo processing by selecting a logical unit to be reformatted.

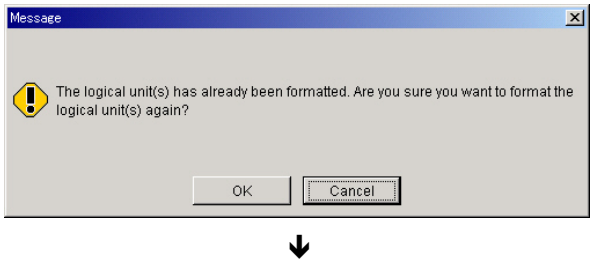
Note 2: In the ShadowImage in-system replication, Truecopy, or Copy-on-write SnapShot, PAIR cannot be defined for the LU being formatted. LU defined as PAIR cannot be formatted.

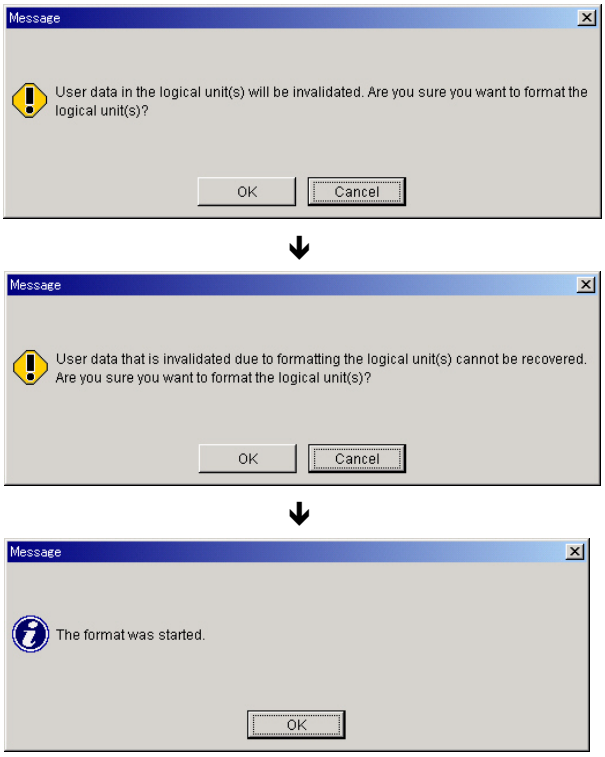
2. A confirmation message displays and asks you to confirm whether the selected logical units may be formatted or not. Check the message, and click **OK**. Depending on whether there are formatted logical units among the logical units or not, the message description is different.

   When there is no formatted logical unit:

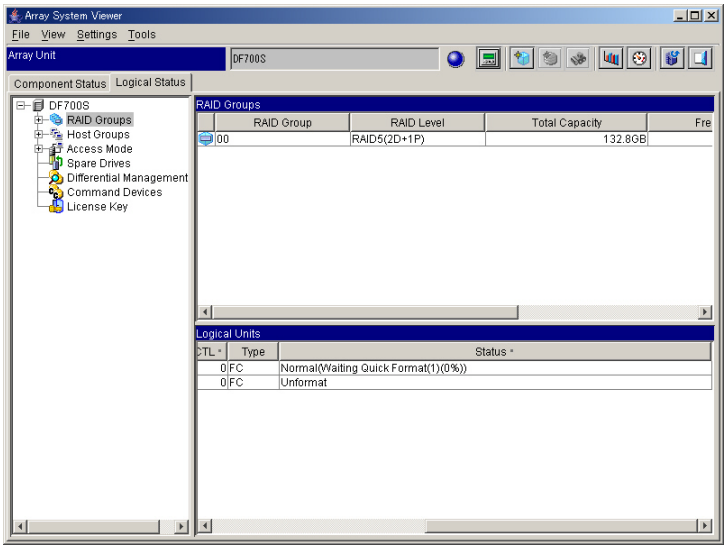


   When there is a formatted logical unit:

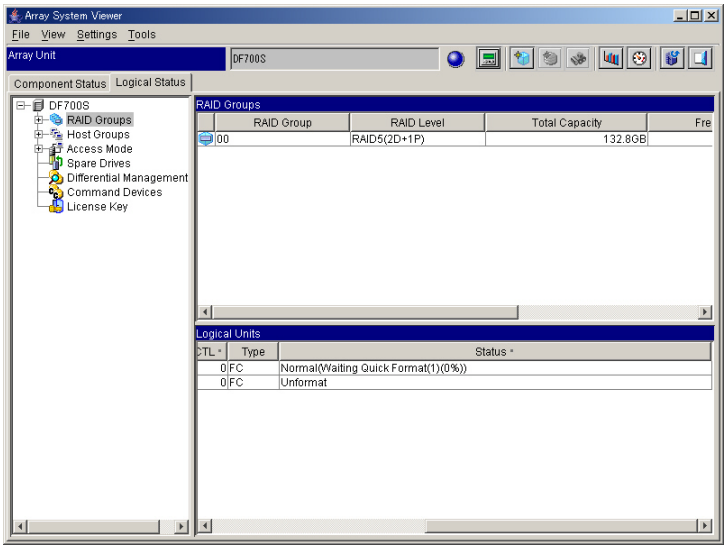



Message
User data in the logical unit(s) will be invalidated. Are you sure you want to format the logical unit(s)?
OK
Cancel
Message
User data that is invalidated due to formatting the logical unit(s) cannot be recovered. Are you sure you want to format the logical unit(s)?
OK
Cancel
Message
The format was started.
OK

The progress rate of formatting process in the background displays in the **Status** box. The progress rate of formatting process is not displayed automatically.



(NAS)



To confirm the latest progress rate, refresh the display by clicking **Refresh**.

3. **Normal** displays in the **Status** box. (When the formatting is in execution, the progress status displays.)

If formatting is terminated abnormally, review the results.

The formatted logical information is updated and the window displays.

Table 7.2 Formatting Message

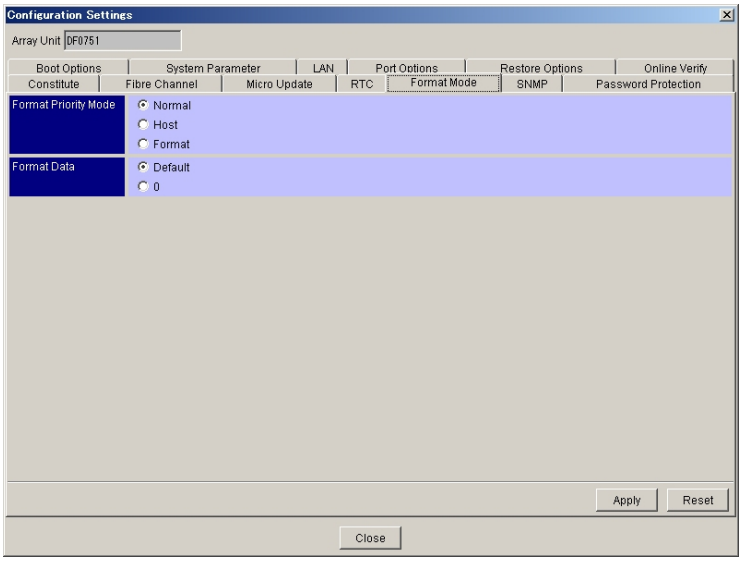
Displayed	Action to be Taken
02-xxxx, 03-xxxx, 04-xxxx or 0B-xxxx	For the above code, a hardware fault is assumed. If the fault is not recovered after re-execution, contact Acer | HDS.
05-xxxx	For the above code, an operation error is assumed. Upon checking the following items and re-execute processing. If the error is not recovered, contact Acer | HDS.
05-2500 or 05-2581	Is logical unit 0 defined?
05-2600	In spite of none of drive mounted states, is ALL RAID specified and is a logical unit specified for ALL CAPA formatted?
05-2580	Is an attempt made to define a logical unit exceeding the capacity of the defined RAID group?
0B-FD01	Switching a controller in charge of a logical unit occurred during formatting. Check the controller in charge and re-execute formatting from the controller in charge.
DMEA000006 or DMEA000007	Drive failure recovery or ShadowImage-In-System Replication, TrueCopy Synchronous Remote Replication, and/or Copy-on-Write Snapshot may be in operation. Check the status of the subsystem.

7.4.8 Changing the Format Mode

This mode enables the subsystem to set the priority of host access and the format for the format in the background.

To set the Format Priority Mode, follow these steps:

1. On the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** button on the toolbar.
2. Click the **Format Mode** tab.
3. Click the desired radio button from the **Format Priority Mode**.



The following table lists and describes the operation of each mode.

No.	Mode	Operation
1	Normal (Default)	Formats at an idle time when no host I/O is executed.
2	Host	Host I/O instruction is executed preferentially.
3	Format	Formats are done preferentially.

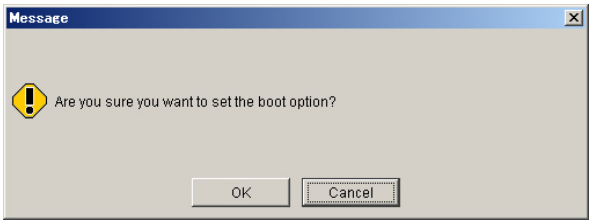
Note1: Formatting using the **Format Priority Mode** allows the subsystem to minimize the effects from host access and complete the format promptly, for the online format during the disk drive addition or during the recovery work from the two points disk drive failure. Host access performance may be significantly affected because this mode restricts commands from host.

In the following cases, do not set the **Format Priority Mode** to **Format;** it may cause a significant deterioration in host access performance or a command time out.

- Accessing the host in which the logical unit is in the same RAID group as logical unit being formatted
- Formatting while using ShadowImage in-system replication, Truecopy, or Copy-on-write SnapShot

Note2: When format is performed while copying or restoring using ShadowImage in-system replication, or Copy-on-write SnapShot, set the Format Priority Mode to Normal.

4. When the setting is complete, click **Apply** on the **Configuration Setting** screen. The following message appears, click **OK**.



5. A message appears when the setting is complete, click the **OK**. Click **Close** on the **Configuration Settings** screen.

Note: The **Format Mode** tab includes the **Format Data** items, from which format data can be selected. Normally, use the **Default**. Use the **0**(zero) in the **Format Data** only when it is necessary to clear the logical unit to **0**(zero) at the time of connecting to TagmaStore USP.

7.4.9 Changing the Default Controller in Charge of an LU

Note: The controller in charge of a default LU can be changed only for the dual active mode configuration of a dual system.

To change the controller in charge of a default LU, follow these steps:

1. Turn on the power supply.

Note: If the power supply has already been turned on, proceed to the next step.

2. Start the Storage Navigator-Modular program and set the operation mode in **Management Mode**.
3. Double-click the **icon** of an array unit on the Main window. Select the **Settings** menu, and then click **Display Details**. Alternately, click **Display Details** on the tool bar.
4. Click the **Logical Status** tab on the Unit screen.
5. Select the logical unit for which you want to change the Change Default Controller.
6. On the **Settings** menu, select **Logical Unit** and select **Change Default Controller**. A message displays requesting confirmation to change the default controller.
7. Click **OK.** The default controller in charge of a logical unit will be changed.
8. A message displays stating that the setting is complete. Click **OK**.

7.5 Setting Host Group Information

In the AMS200, the Host Connection Mode, the mapping information of Logical Unit, and LUN security information are set to the group of hosts, not to the host. This enables you to select the host computer to which the subsystem is connected depending on each group of hosts.

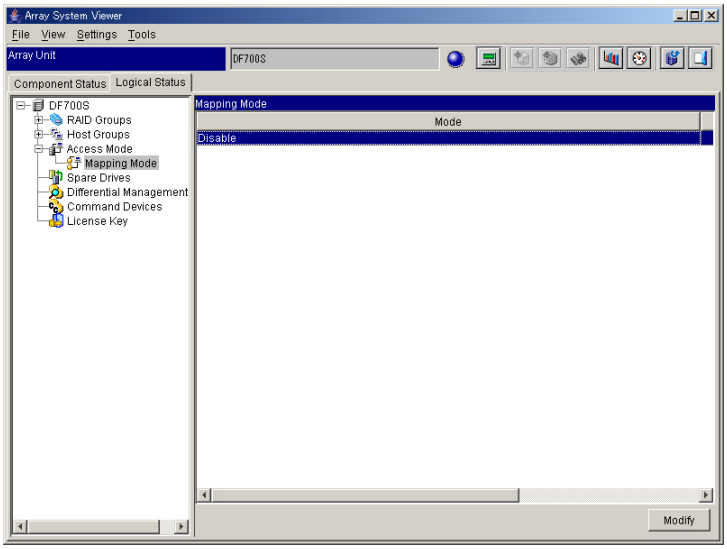
For host groups, only the **000:G000** is supported. Up to 128 host groups can be set when the LUN Manager is used.

The host group Information does not need to be set for the NAS system.

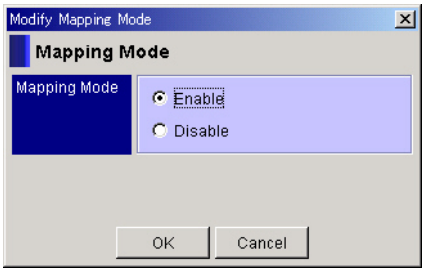
7.5.1 Setting Mapping Information

To set mapping information:

1. In the unit window, click the **Logical Status** tab.
2. Double-click the **Access Mode**, and select **Mapping Mode**:

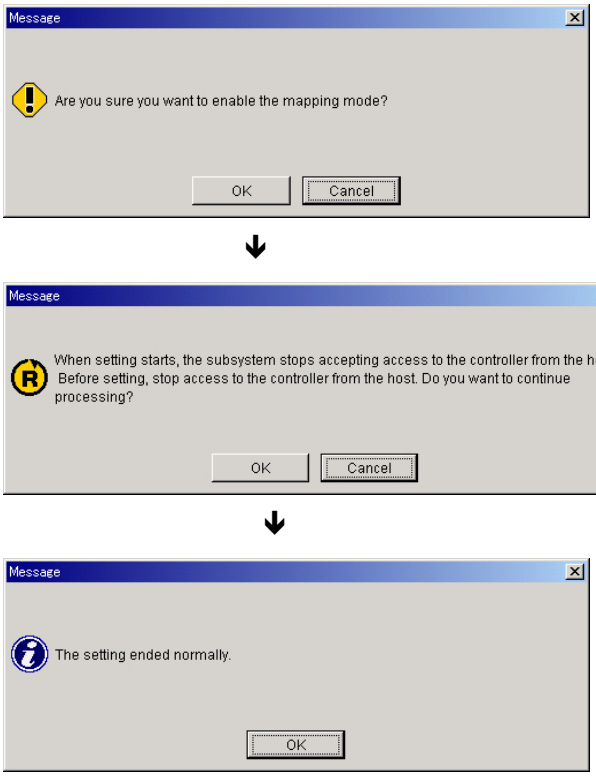


3. On the Mode list, select **Disable**, and then click **Modify**:



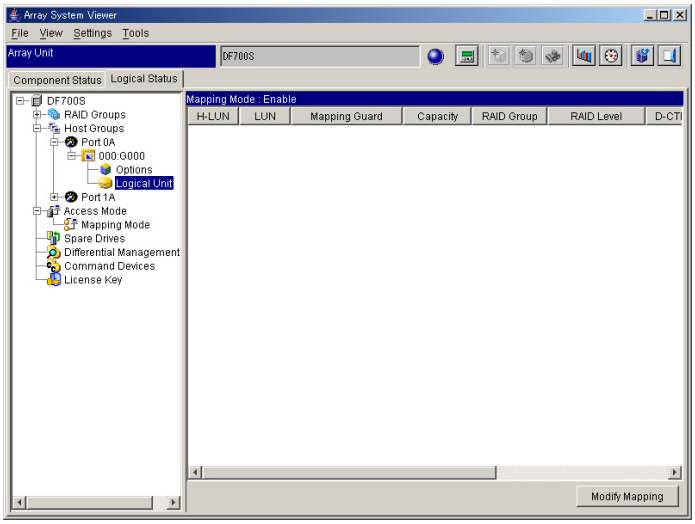
4. On the **Mapping Mode** dialog box, select the **Enable** radio button, and then click **OK**.

5. A confirmation message displays. Click **OK**.

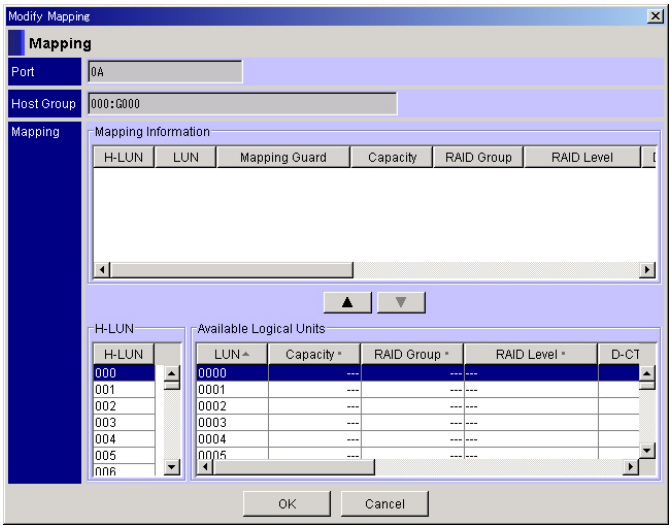

Message
Are you sure you want to enable the mapping mode?
OK
Cancel
Message
When setting starts, the subsystem stops accepting access to the controller from the host. Before setting, stop access to the controller from the host. Do you want to continue processing?
OK
Cancel
Message
The setting ended normally.
OK

6. On the Unit window, double click **Host Groups**, and then double-click the **Port** which you want to set for the connection mode with the host. Display **000:G000** by double-clicking **Port**.

7. Display the **Option** and **Logical Unit** by clicking **000:G000**, and then click **Logical Unit**:



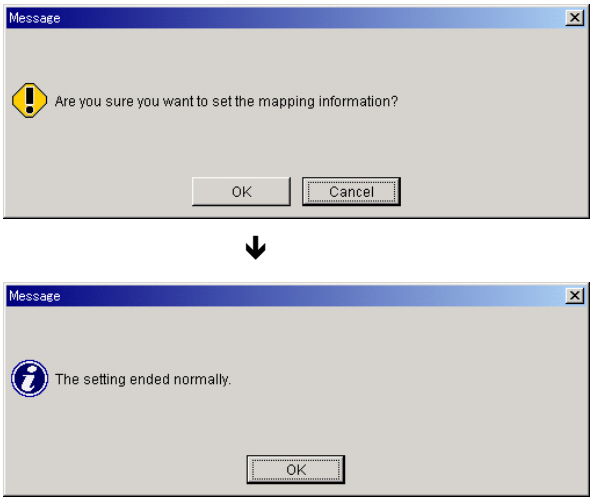
8. Click **Modify Mapping**. The **Mapping** dialog box displays:



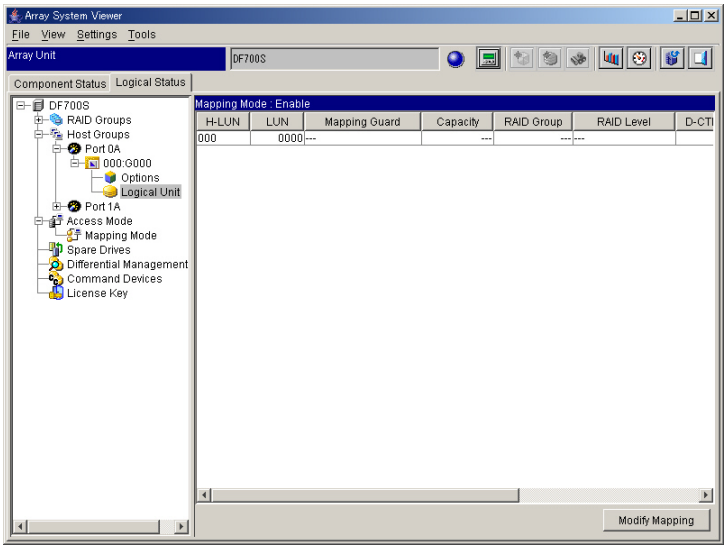
9. Select one H-LUN from the **H-LUN** list, select an LUN that you want to map for the H-LUN from the **Available Logical Units** list, and then click the ▲ button. The selected H-LUN and LUN will be moved to the **Mapping Information** list.

10. Repeat step 9 to complete the **Mapping Information** list.

11. A confirmation message displays. Click **OK**.



The mapping information is updated and the following window displays:



12. Make the setting for the other ports in the same way as described previously.

7.6 Setting Target Information

In the AMS200, the Host Connection Mode, the mapping information of Logical Unit, and LUN security and iSCSI User information for authentication are set to the targets, not to the ports at the time of iSCSI interface addition. This enables you to select the host computer to which the subsystem is connected, depending on each target.

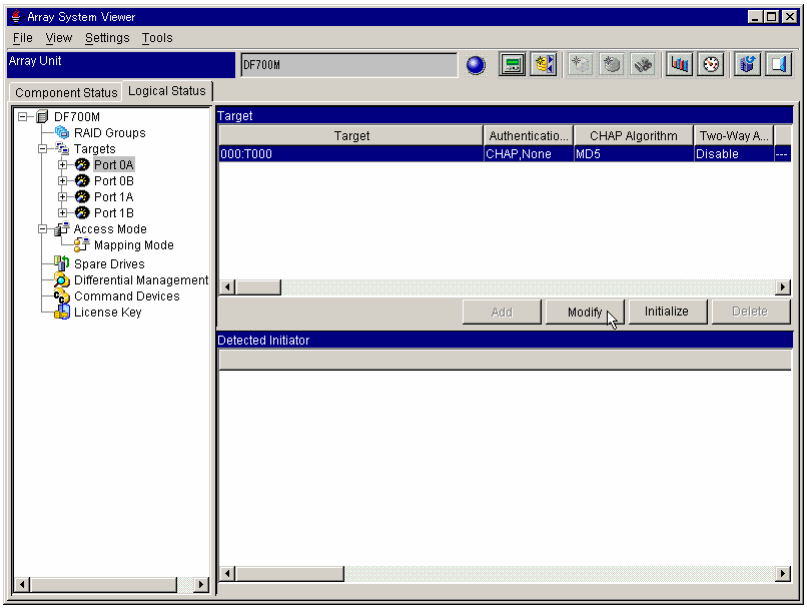
For targets, only the **000:T000** is supported.

Up to 128 targets can be set when the LUN Manager (an extra cost optional feature) is used.

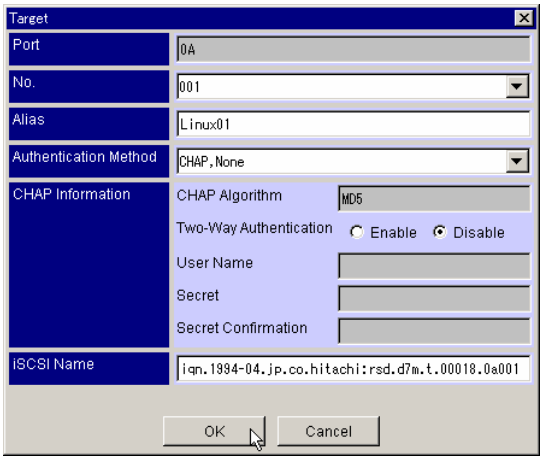
7.6.1 Changing the Target Information

To change the iSCSI Name, Alias, Authentication Method, and CHAP User information of Two-Way Authentication about the Target:

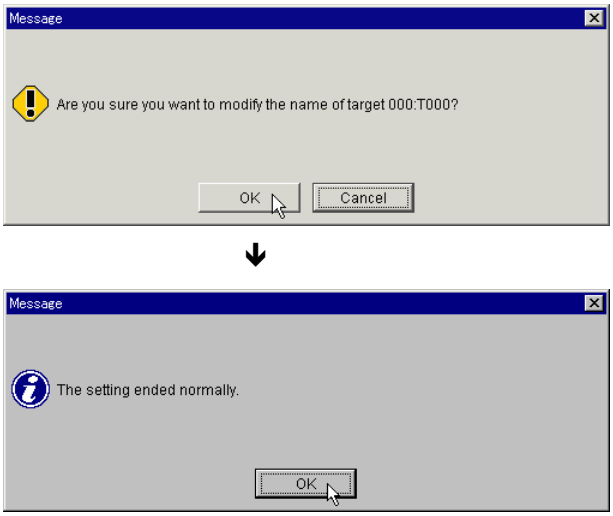
1. Click the **Logical Status** tab on the Unit screen.
2. Click the Port.
3. Select the Target to be changed from the **Target** list.
4. Select the **Modify** button.



The **Target** dialog is displayed.

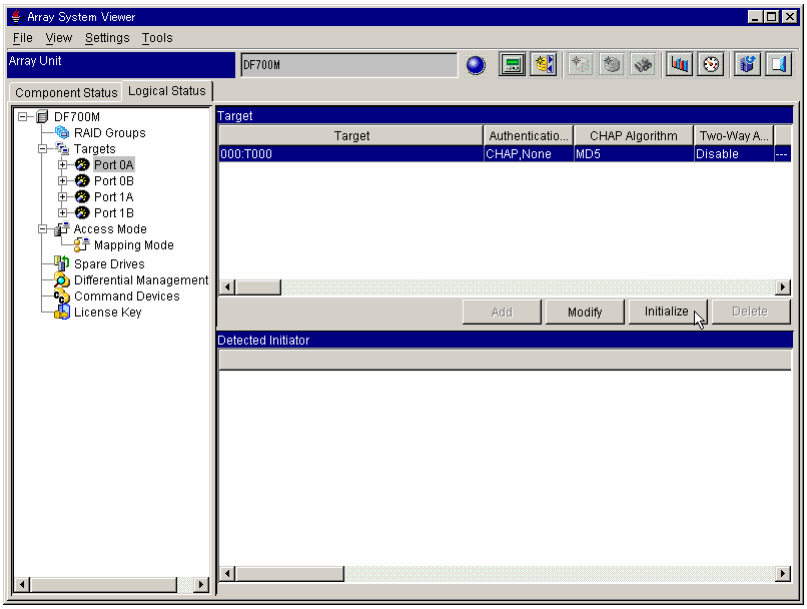


5. In the **Target** dialog, enter the alias and iSCSI Name.
6. Select the authentication method from the drop-down list.
   - **Alias:** Enter the alias of the Target with 32 or less alphanumeric character. (Excluding \, /, : , , , ;, *, ?, “, <, >, | and ‘)
     Spaces at the top or end are ignored. An identical name cannot be used in an identical Port.
   - **Authentication Method:** Select the **CHAP**, **None**, or **CHAP, None**.
   - **iSCSI Name:** Enter the name of the iSCSI Name with 233 or less alphanumeric character. A period (.), hyphen (-), and colon (:) can be used.
7. Select the **OK** button.
8. The confirmation message is displayed. Select the **OK** button.

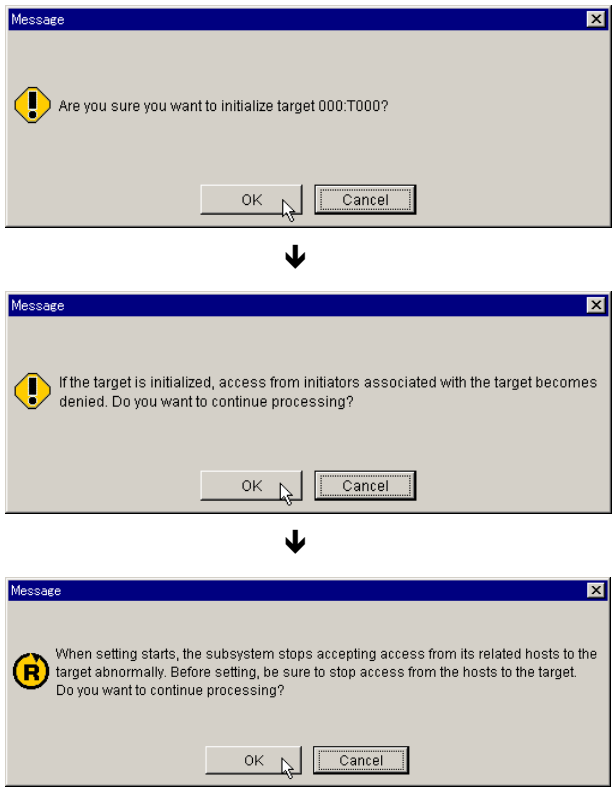


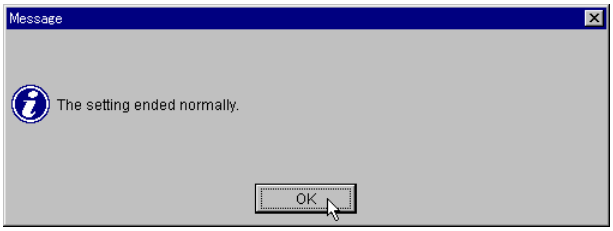
7.6.2 Initializing the Target 0

1. Click the **Logical Status** tab on the Unit screen.
2. Click the Port.
3. Select the Target to be initialized from the **Target** list.
4. Select the **Initialize** button.



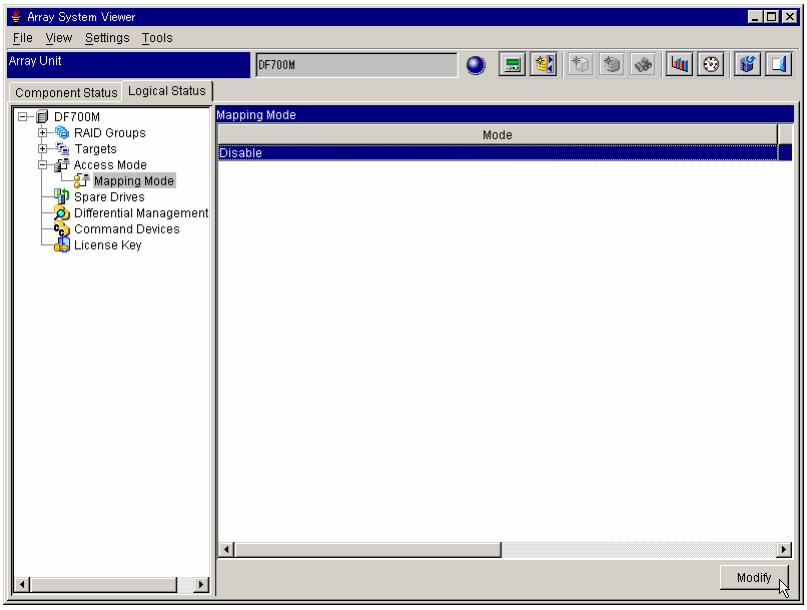
5. The confirmation message is displayed. Select the **OK** button.


Message
Are you sure you want to initialize target 000:T000?
OK
Cancel
Message
If the target is initialized, access from initiators associated with the target becomes denied. Do you want to continue processing?
OK
Cancel
Message
When setting starts, the subsystem stops accepting access from its related hosts to the target abnormally. Before setting, be sure to stop access from the hosts to the target. Do you want to continue processing?
OK
Cancel

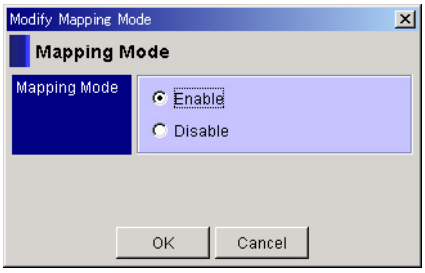


7.6.3 Setting Mapping Information

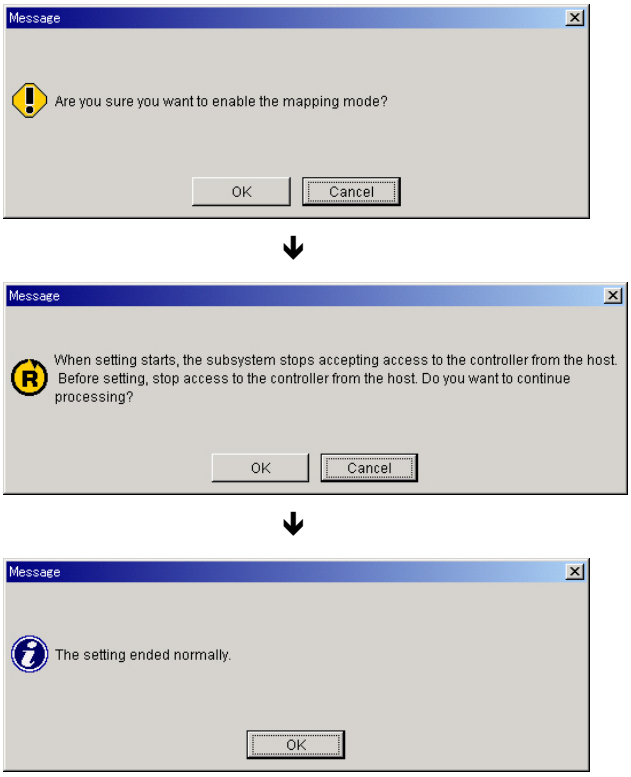
1. Click the **Logical Status** tab on the Unit screen.
2. Double-click the **Access Mode**, and select the **Mapping Mode**.
3. On the **Mode** list, select the **Disable**. Click the **Modify** button. **Mapping Mode** dialog box is displayed.



4. On the **Mapping Mode** dialog, click the **Enable** radio button, and click the **OK** button.

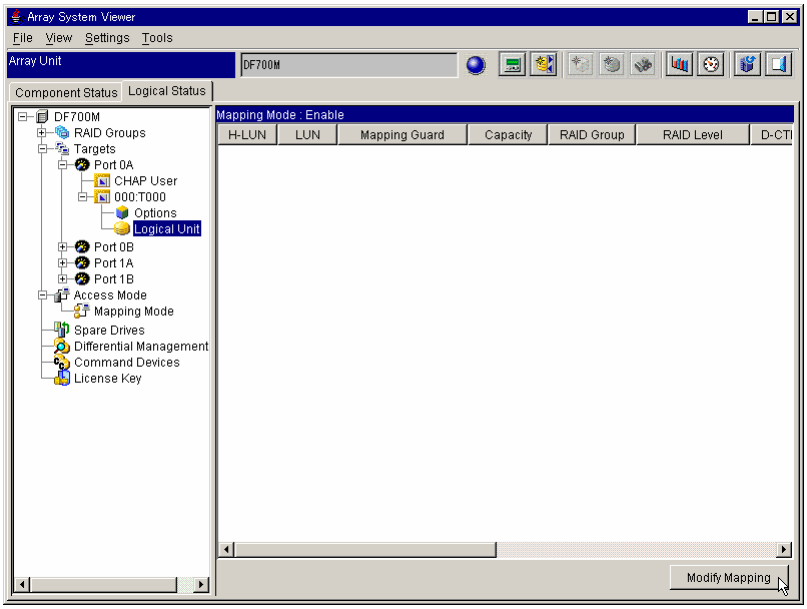


5. A confirmation message appears, click the **OK** button.

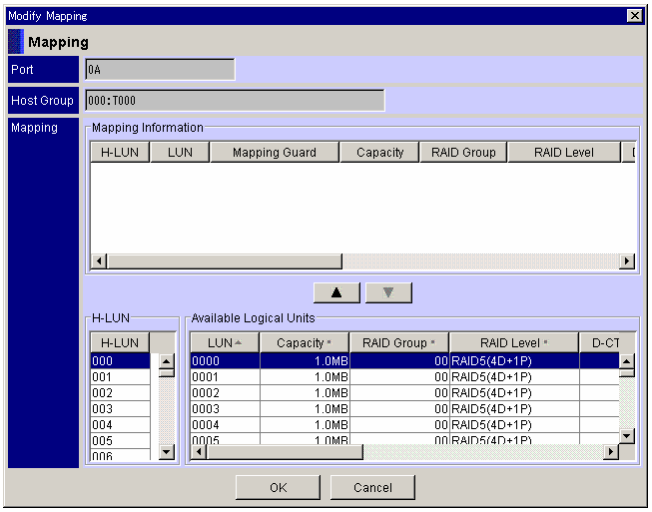

Message
Are you sure you want to enable the mapping mode?
OK
Cancel
Message
When setting starts, the subsystem stops accepting access to the controller from the host. Before setting, stop access to the controller from the host. Do you want to continue processing?
OK
Cancel
Message
The setting ended normally.
OK

6. On the Unit window, double click the **Target**, and double-click the **Port** which you want to set for the connection mode with the host. Display **000:T000** by double-clicking the **Port**.

7. Display the **Options** and **Logical Unit** by clicking **000:T000**, then click the **Logical Unit**.



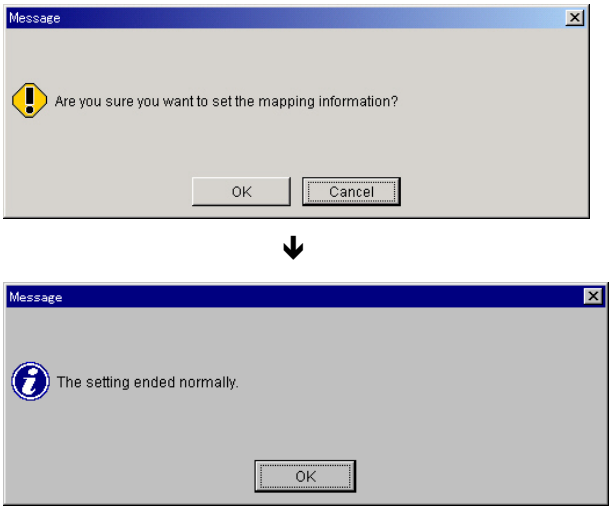
8. Click the **Modify Mapping** button. **Mapping** dialog is displayed.



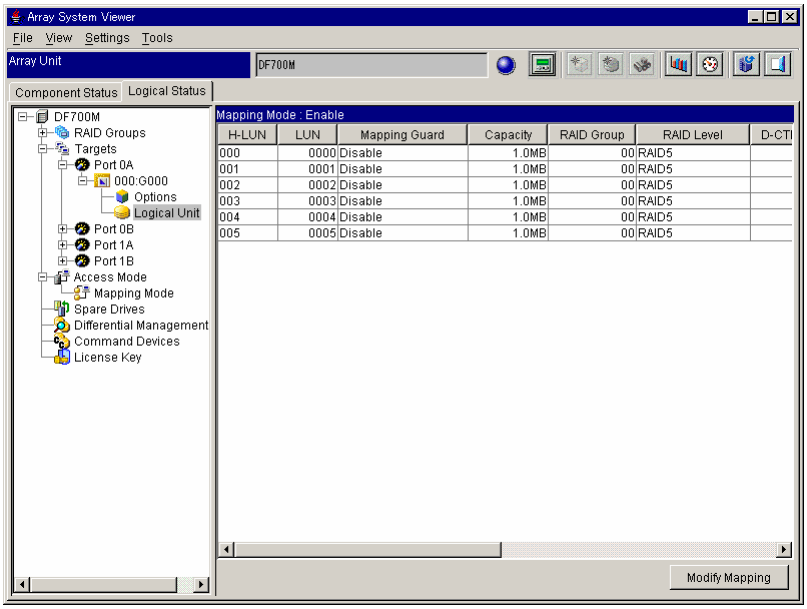
9. Select one H-LUN from the **H-LUN** list, select an LUN that you want to map for the H-LUN from the **Available Logical Units** list, and click ▲ button.
   The selected H-LUN and LUN will be moved to the **Mapping Information** list.

10. Repeat step 9 to complete the **Mapping Information** list.

11. A confirmation message appears, click the **OK** button.



The mapping information is updated and the following window is displayed.



12. Set the settings for the other ports using the same procedure.

7.7 Setting CHAP Authentication

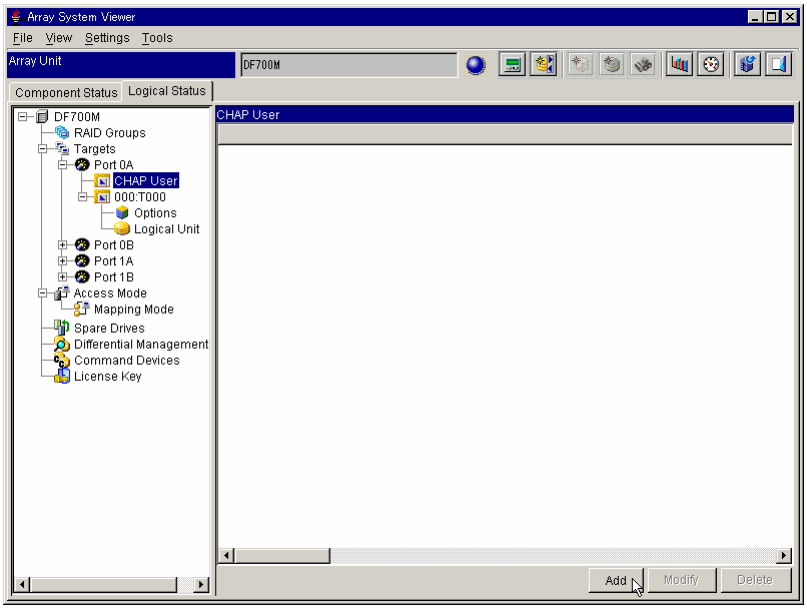
The disk array subsystem can authenticate both the iSCSI User Initiator Authentication and Two-Way Authentication(Target Authentication) with the CHAP(Challenge Handshake Authentication Protocol).

Set the same iSCSI User information(User Name/ Secret) on both the host side and the disk array subsystem side for Initiator Authentication. Set the same iSCSI User information(User Name/ Secret) on both the host side and the disk array subsystem side for Two-Way Authentication(Target Authentication).

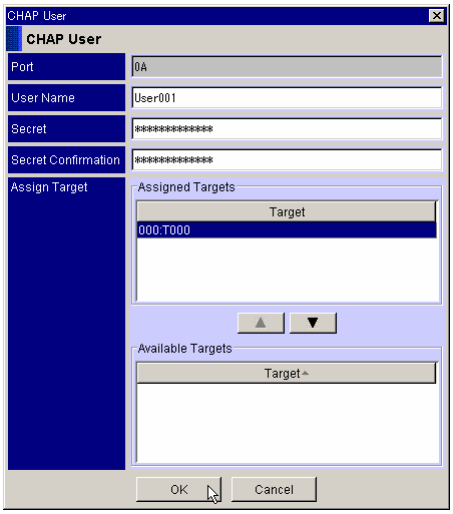
7.7.1 Adding a CHAP User

To authenticate the initiator, set the CHAP User to the port and assign it to the Target.

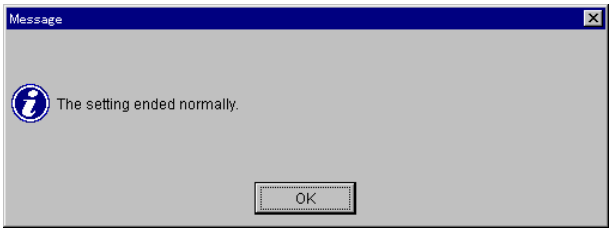
1. Click the **Logical Status** tab on the Unit screen.
2. Double-click the **Port** to which you want to add the CHAP User and select **CHAP User**.
3. Select the **Add** button.



The **CHAP User** dialog is displayed.



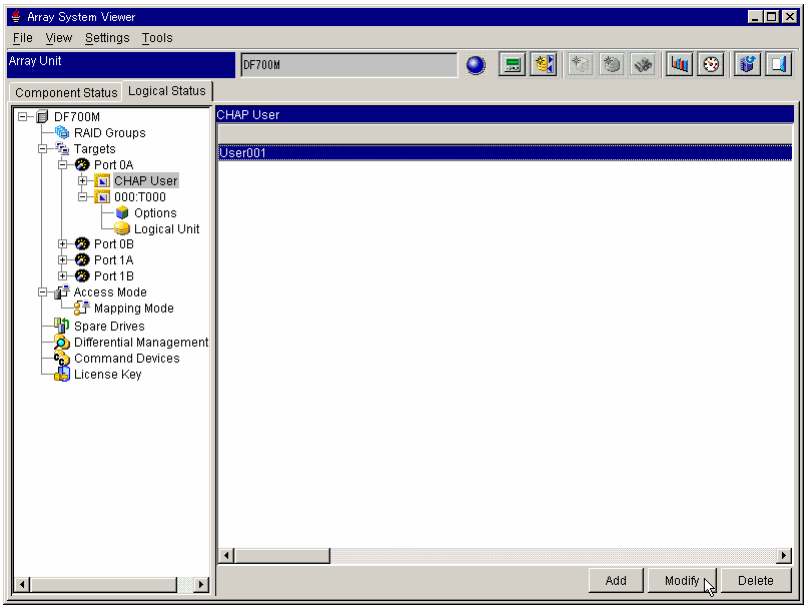
4. In the **CHAP User** dialog, enter the **User Name**, **Secret**, and **Secret Confirmation.**
   - **User Name:** Enter the name of the User with 256 or less alphanumeric character. The following symbols can be used: (. - + @ _ = : / [ ] , ~ (space))
   - **Secret:** Enter the Secret from 12 through 32 alphanumeric characters. The following symbols can be used: (. - + @ _ = : / [ ] , ~ (space))
   - **Secret Confirmation:** Enter the characters that enter into the **Secret**.
5. From the **Available Targets** list, select the target to be assigned, select the ▲ button.
6. Click the **OK** button.
7. A confirmation message appears. Click the **OK** button.



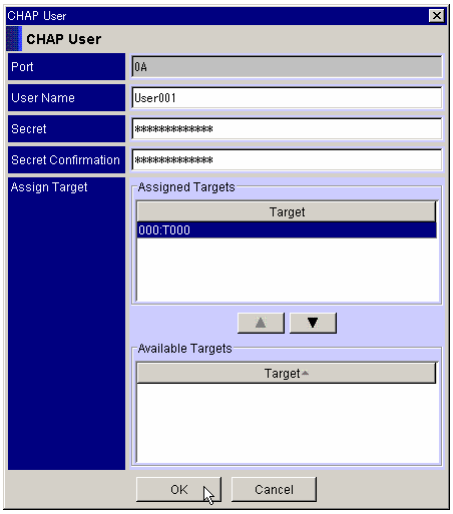
7.7.2 Changing the CHAP User

1. Click the **Logical Status** tab on the Unit screen.
2. Double-click the **Port** of which you want to change the CHAP User, and then select the **CHAP User**.
3. Select the **CHAP User** to be changed from the **CHAP User** list.

4. Select the **Modify** button.

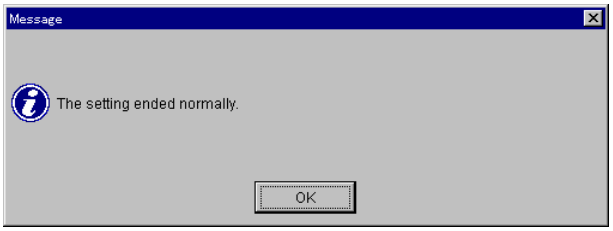


The CHAP User dialog is displayed.



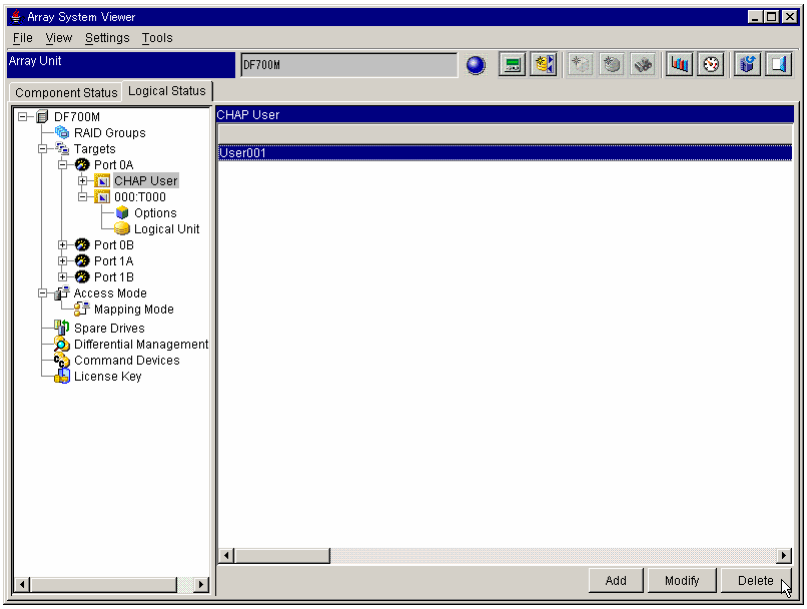
5. As necessary, enter the **User Name**, **Secret**, and **Secret Confirmation**.
6. As necessary, change the assigned Target, and then select the **OK** button.

7. The confirmation message is displayed. Select the **OK** button.

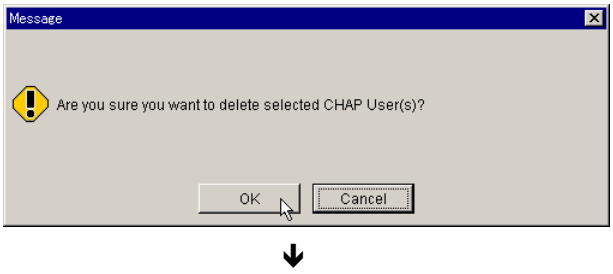


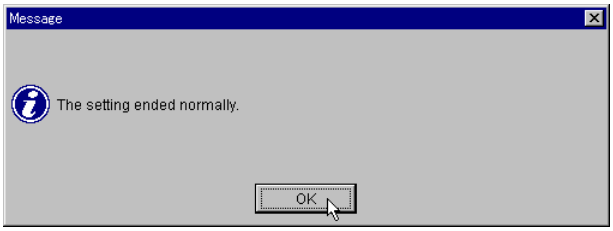
7.7.3 Deleting the CHAP User

1. Click the **Logical Status** tab on the Unit screen.
2. Double-click the **Port** of which you want to delete the CHAP User and select **CHAP User**.
3. Select the **CHAP User** to be deleted from the **CHAP User** list.
4. Select the **Delete** button.



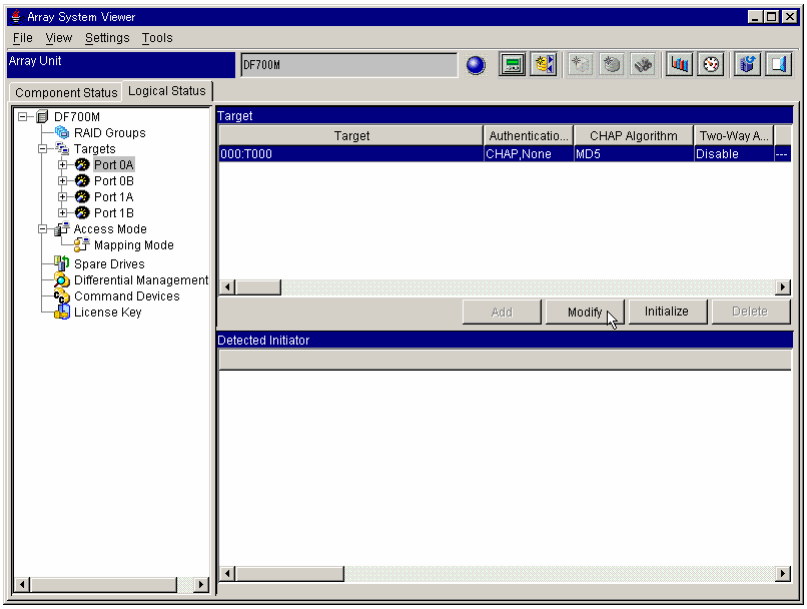
5. The confirmation message is displayed. Select the **OK** button.



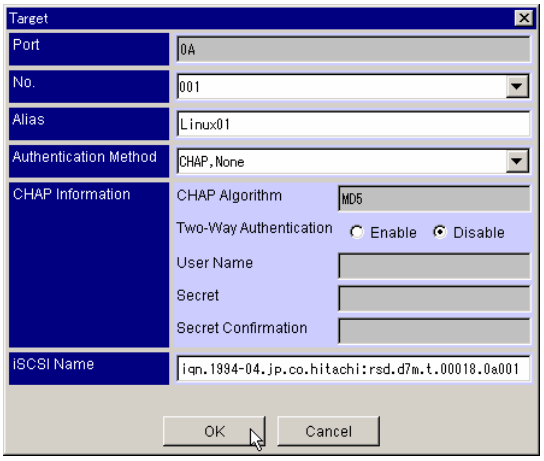


7.7.4 Changing the Two-Way Authentication Information

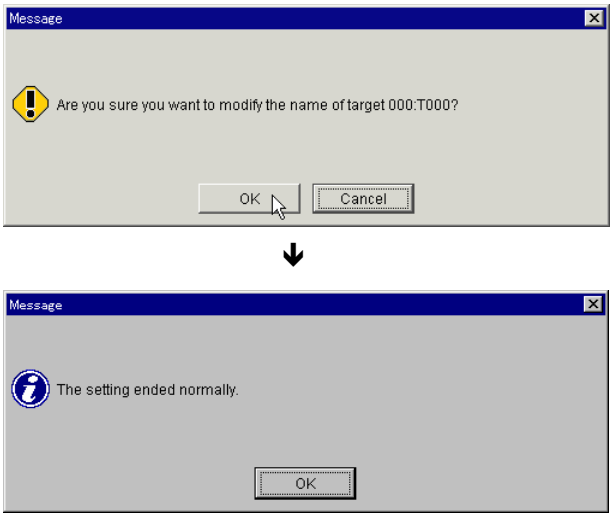
1. Click the **Logical Status** tab on the Unit screen.
2. Click the **Port**.
3. Select the **Target** to be changed about Two-Way Authentication from the **Target** list.
4. Select the **Modify** button.



The **Target** dialog is displayed.



5. In the **Target** dialog, select the **Two-Way Authentication** radio button.
   - **User Name:** Enter the name of the User with 256 or less alphanumeric character. The following symbols can be used: (. - + @ _ = : / [ ] , ~ (space))
   - **Secret:** Enter the Secret from 12 through 32 alphanumeric characters. The following symbols can be used.
6. Select the **OK** button.
7. The confirmation message is displayed. Select the **OK** button.



7.8 Transferring Configurations from One Array to Another

Output the configuration information of the array unit in a text file or set configuration using a text file. The configuration information output in a text file includes the status of the system parameters, RAID group/logical unit and the constituent parts of the array unit. The configuration to be set includes the system parameters and RAID group/logical unit. The status of the constituent parts of the array unit cannot be set.

Configuration information is handled with separate text files for the system parameters and for RAID group/logical unit.

Copying configuration information between array units can be executed by outputting a text file of the configuration from an array unit, then using the output text file to set another array unit.

Editing a text file to set an array unit can be executed, but it is recommended that this function be used for the configuration of the same array unit. To change the configuration, use individual functions.

7.9 Storing Configuration Data

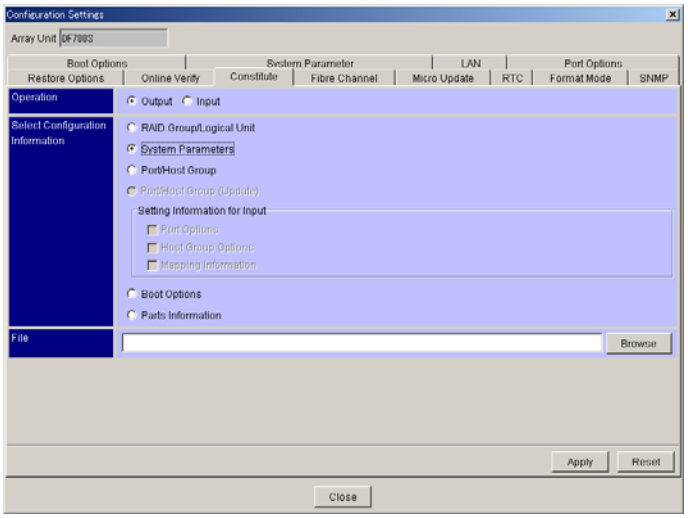
This section includes the following:

- System parameter information
- RAID group/LU information
- Port/host group information

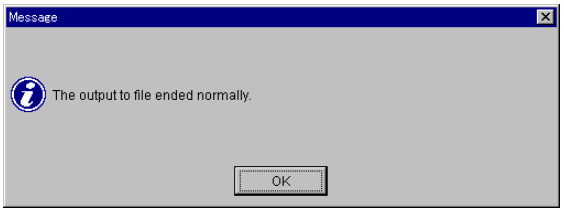
7.9.1 System Parameter Information

To output the setting of the system parameters for an array unit in text form to a specified file:

1. On the **Tools** menu, select **Configuration Settings,** or click **Configuration Settings** on the toolbar.
2. Click the **Constitute** tab.
3. Check the **System Parameters** in the **Select Configuration Information** box:



4. Click **Browse**. Specify the directory and file name to which the configuration file will be output for the **File** box.
5. Click **Apply**.
6. When a message dialog box displays confirming the system parameter information is output with the specified file name, click **OK**:

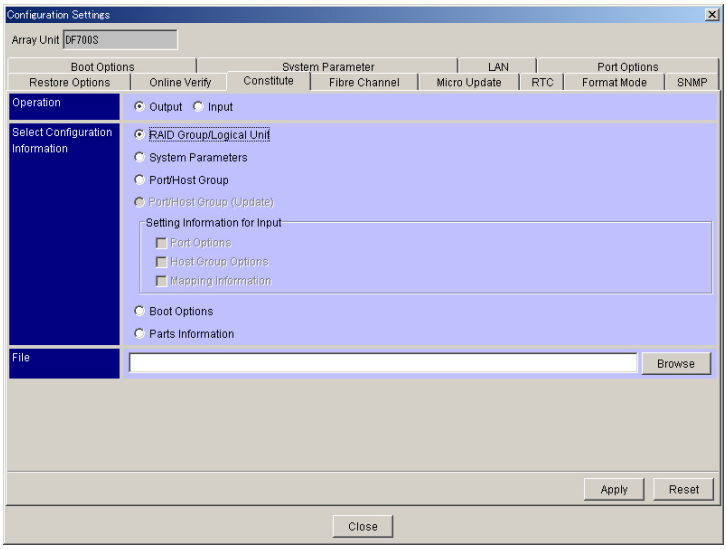


System parameter information is saved in the form of a text file with the specified file name.

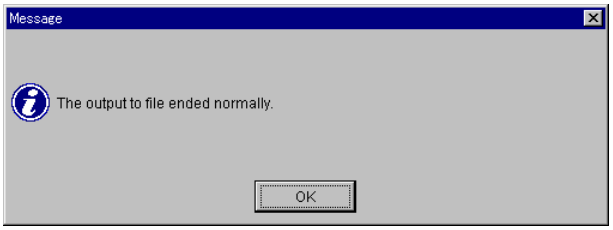
7.9.2 RAID Group/LU information

To output the RAID group/logical unit definition information already set in an array unit to a specified file in a text format:

1. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the toolbar.
2. Click the **Constitute** tab.
3. Check the **RAID Group/Logical Unit** in the **Select Configuration Information** box:



4. Click **Browse**, and then specify the directory and file name to output the file of the configuration.
5. Click **Apply**.
6. A message box displays confirming the system parameter information is output with the specified file name. Click **OK**:



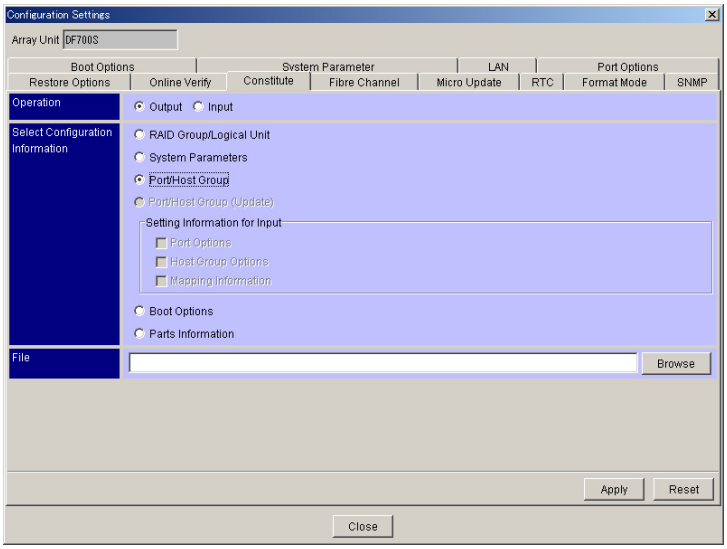
RAID group/LU information is saved in the form of a text file with the specified file name.

7.9.3 Port/Host Group Information

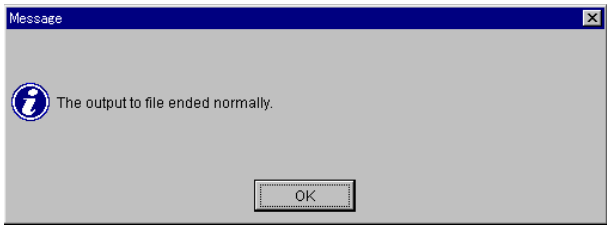
This setting is not required for the NAS system.

To output Port/Host group definition information previously set in an array unit to a specified file in a text format:

1. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the toolbar.
2. Click the **Constitute** tab.
3. Check the **Port/Host Group** in the **Select Configuration Information** box:



4. Click **Browse**, and then specify the directory and file name to output the file of the configuration for the **File**.
5. Click **Apply**.
6. A message box displays confirming the system parameter information is output with the specified file name. Click **OK:**



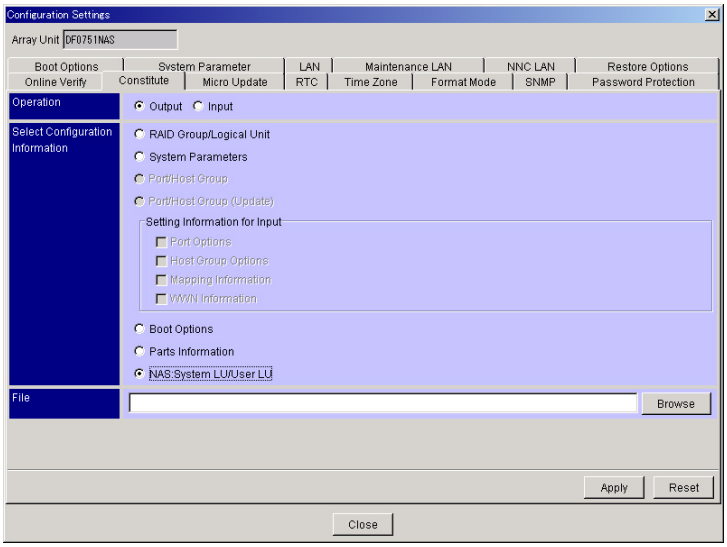
Port/Host group information is saved in the form of a text file with the specified file name.

7.9.4 NAS System LU/User LU Information

This setting is required only for the NAS system.

To output NAS System LU/User LU information already set in an array unit to a specified file in a text format:

1. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the toolbar.
2. Click the **Constitute** tab.
3. Check the **NAS: System LU/User LU** in the **Select Configuration Information** box.



4. Click **Browse**, and then specify the directory and file name to output the file of the configuration for the **File**.
5. Click **Apply**.
6. A message box displays confirming the system parameter information is output with the specified file name. Click **OK.**

NAS System LU/User LU information is saved in the form of a text file with the specified file name.

7.10 Applying Configuration Data to another AMS200 Subsystem

This section includes the following:

- System parameters
- RAID group/logical unit
- Port/host group

7.10.1 System Parameters

Use the modes discussed in this section only when recommended by a Acer | HDS Host or Optional Product installation guide.

Set the system parameters in the array unit with the information described in the file. If you set the system parameters using a file that was output when a priced optional feature is in an unlocked state, the setting may terminate abnormally. To set system parameters, use a file that was output when all priced optional features are in a locked state.

For a dual system, the setting cannot be executed if one of the controllers is detached. Confirm that the array unit is operating normally.

While the system parameters are being set, the array unit cannot execute commands from the host. The functions of Storage Navigator-Modular can no longer work with the exception of the Wizard for setting the system parameters and failure monitoring. After setting, restart the array unit. Confirm that it is operating successfully, and then connect to the host and the Storage Navigator-Modular management program.

Note: If the system parameter setting operation is performed for the array unit connected to the NAS unit, the cluster between the NAS Units stops. When the system parameter setting operation for the array subsystem is unavoidably performed, execute it after stopping the cluster between the NAS Units and stopping the NAS OS of both NAS Units. Start the cluster between the NAS Units again after completing the system parameter setting operation.

1. Edit the file for which you will set system parameters to set the array unit. This file has a specified format. The format of the file is the same as that of the file output by the array unit. To format a file, refer to the file output in section 7.9.
2. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the toolbar.
3. Click the **Constitute** tab.
4. Select the **Input** radio button in the **Operation** box.
5. Select the **System Parameter** radio button in the **Select Configuration Information** box.
6. Click **Browse**, and then specify the directory and file name of the file that describes the system parameters edited in 1. The specified file name displays in the text box.
7. Click **Apply**.

Note: To validate the set system parameters, restart the array unit. The previous settings stay valid until restarting. The array unit cannot access the host until the reboot is completed and the system restarts. Therefore, be certain the host has stopped accessing data before beginning the restart process.

7.10.2 RAID Group/Logical unit



Ensure you back up all data before performing this procedure. **All user data is lost when the logical unit is deleted**.

Set the array unit according to the RAID group/logical unit setting information described in a file. If the setup of RAID group/logical unit is configured and completed, all user data previous data will be lost; RAID group/logical unit configuration as specified in the file will be set after deleting the current RAID group/logical unit. If user data is needed, configure the setting after backing up the system.

1. Edit the file for which you will set system parameters to set the array unit. This file has a specified format. The format of the file is the same as that of the file output by the array unit. To format a file, refer to the file output in section 7.9.
2. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the toolbar.
3. Click the **Constitute** tab.
4. Select the **Input** radio button in the **Operation** box.
5. Select the **RAID Group/Logical Unit** radio button in the **Select Configuration Information** box.
6. Click **Browse**, and then specify the directory and name of the file that describes the RAID group definition and logical unit definition edited in 1. The specified file name displays in the text box.
7. Click **Apply**.

To check the configuration, select the **Logical Status** tab.

7.10.3 Port/Host Group

This setting is not required for the NAS system.

1. Edit the file for which you will set system parameters to set the array unit. This file has a specified format. The format of the file is the same as that of the file output by the array unit. To format a file, refer to the file output in section 7.9.
2. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the toolbar.
3. Click the **Constitute** tab.
4. Select the **Input** radio button in the **Operation** box.
5. Select the **Port/Host Group** radio button in the **Select Configuration Information** box.
6. Select the item that you want to set from the **Setting Information for Input**. If nothing is selected, an error occurs. (If LUN Manager function is enabled, WWN information also displays in the **Setting Information for Input.**)
7. Click **Browse**, and then specify the directory and name of the file to which the Port/Host Group information is input for the **File** box.
8. Click **Apply**.
9. Port/Host Group information is entered in the specified file name. A confirmation message box displays Click **OK**.
10. A message box indicating that the setting that has been made displays. Click **OK**.

7.11 Setting Host Connection Parameters

There are two methods for setting options:

- **Simple Setting for Connecting to the Host Computer**

  When using the simple setting, select the environmental elements of the host computer to be connected. When the selection is made, the host group options (host connection mode 1 and 2) necessary for the host computer to be connected are set automatically.

- **Detailed Setting for Each Host Connection**

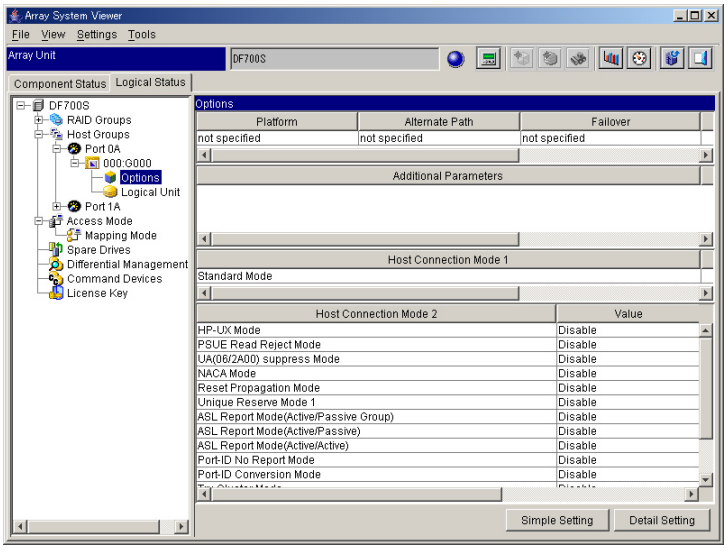
  When using the detailed setting, directly set the necessary host group options (host connection mode 1 and 2) in the same way as the conventional one.

The host group Information does not need to be set for the NAS system.

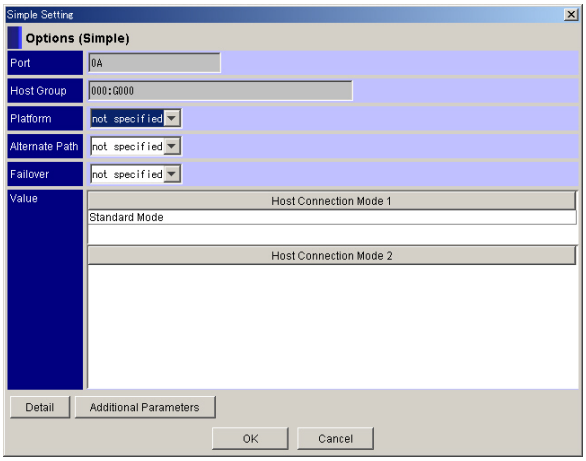
7.11.1 Simple Setting

Set the host group options (host connection mode 1 and 2) that are necessary for the host computer to be connected. To do this, select the environmental elements of the host, such as platform, alternative path, fail-over, and additional parameter. Some host environments require a detailed setting as well as the simple setting. For details, refer to Table B.2.

1. In the Unit window, click the **Logical Status** tab.
2. Double-click **Host Groups** or **Target** (when iSCSI interface board is added). Double-click the **Port** that you want to set for the connection mode with the host to display **000:G000**.
3. Display the **Options** and **Logical Unit** by double-clicking **000:G000**, and select the **Options**:

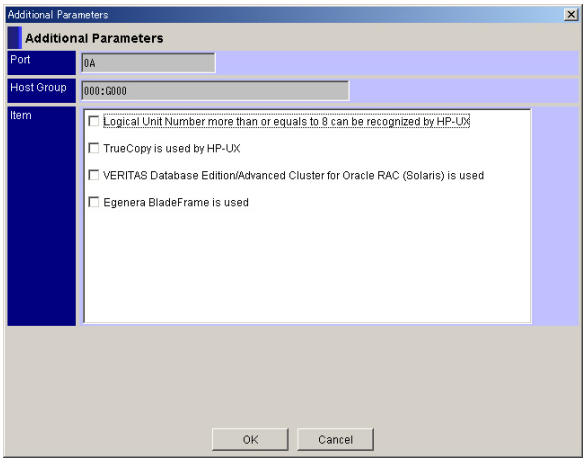


4. Click **Simple Setting**. The **Options (Simple)** dialog box displays:

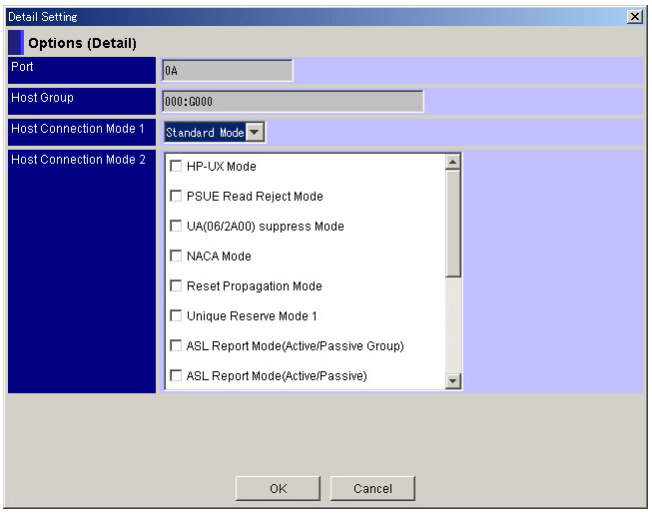


5. Select **Platform**, **Alternative Path**, and **Fail-Over** according to an environment of the host to be connected.

6. Click **Additional Parameters**. The **Additional Parameters Property** dialog box displays. Select the **Item** as occasion demands, and then click **OK**:



7. Click the **Detail** button as needed. Select **Host Connection Mode 1** and **Host Connection Mode 2**, and then click **OK:**



8. On the **Option (Simple)** dialog box, click **OK**.

9. A confirmation message box displays. Click **OK**.\:



10. A message box displays requesting you to verify an I/O requested by the host has been stopped. Stop it and click **OK**. (If the system administrator has not stopped I/O on the host side, clicking this button will stop all I/O processes.):

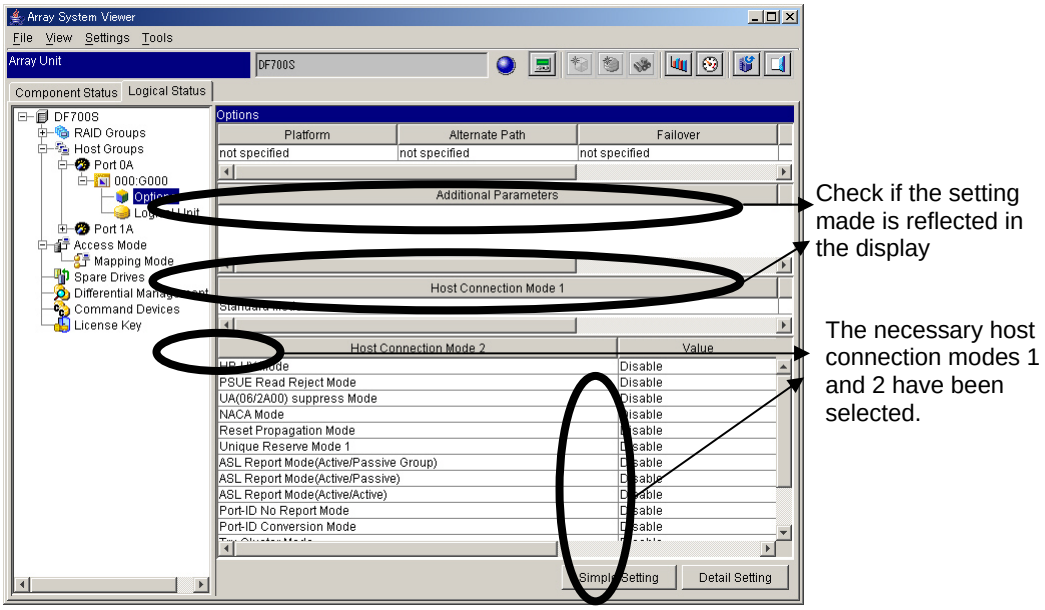

Message
When setting starts, the subsystem stops accepting access to the host group from the host. Before setting, stop access to the host group from the host. Do you want to continue processing?
OK
Cancel

11. A message box displays stating the setting is complete. Click **OK:**



12. The setting displays.

Verify that the selected host environment (platform, alternative path, and fail-over) and the Additional Parameter are reflected in the display. When you have set host connection mode 1 and 2 directly, verify that the mode that has been set is reflected in the display:



13. Set the settings for the rest of the ports in the same way.

Table 7.3 Simple Setting Item List

No.	Menu Item	Description		Factory Setting
		Parameters	Selection Method	
1	Platforms	Not specified	Select one of items	Not specified
		HP-UX®		
		Solaris™		
		AIX®		
		Windows NT®		
		Windows® 2000		
		Windows® 2003		
		Linux®		
		Tru64®		
2	Alternate Path	Not specified	Select one of items	Not specified
		PV Link		
		HDLM		
		VxVM		
		MPxIO		
3	Fail-over	Not specified	Select one of items	Not specified
		MC/ServiceGuard®		
		Sun Cluster		
		VCS		
		HACMP		
		MSCS		
		TruCluster		

Table 7.4 Additional Parameter Setting Items

No.	Menu Item	Description		Factory Setting
		Parameters	Selection Method	
1	Additional Parameter	Logical Unit Numbers more than or equal to 8 can be recognized by HP-UX®	Selection	Not selected
		TrueCopy is used by HP-UX® (see *Note*)	Selection	Not selected
		VERITAS™ Database Edition/Advanced Cluster for Oracle® RAC (Solaris™) is used	Selection	Not selected
		Egenera® BladeFrame® is used	Selection	Not selected

Note: Do not select this parameter because TrueCopy is not supported.

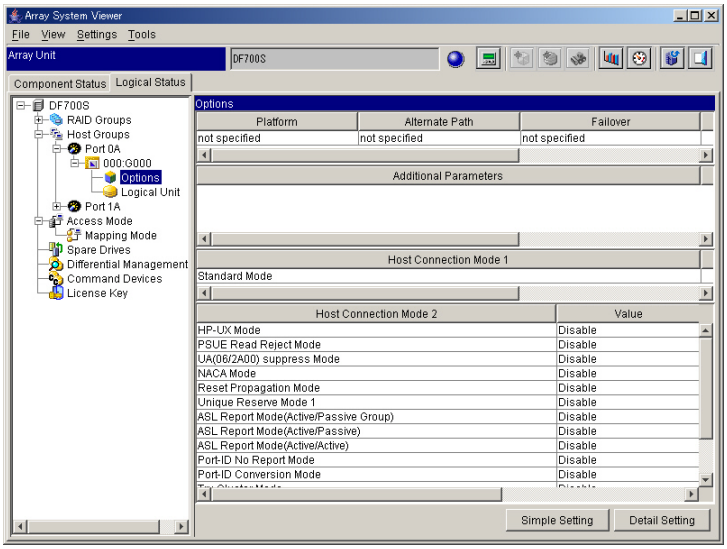
7.11.2 Detailed Setting for Each Host Connection

This operation is performed using the Storage Navigator-Modular.

The following describes the procedure for setting a subsystem when the host group option setting is required for a combination that simple setting does not have.

Follow these steps:

1. On the unit window, click the **Logical Status** tab.
2. Double-click the **Host Groups** or **Target** (when iSCSI interface board is added). Display the 000:G000 by double-click the **Port** which you want to set for the connection mode with the host.
3. Display the **Option** and **Logical Unit** by double-clicking the **000:G000**, and then select the **Option**.



4. Select the **Detail Setting** button**.**

   Perform the operation corresponding to the model to be set.

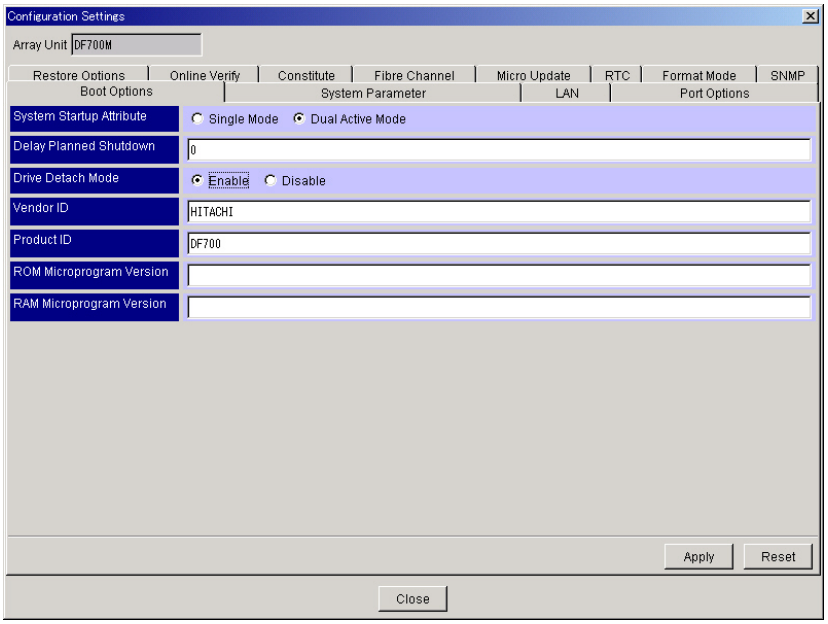
5. Perform the setting for the other ports in the same way as described above.

7.12 Setting the Subsystem when using Special Mode

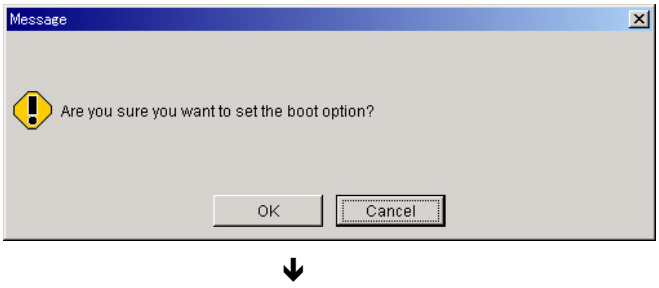
This operation (using the subsystem in drive blockade mode) is performed using Storage Navigator-Modular.

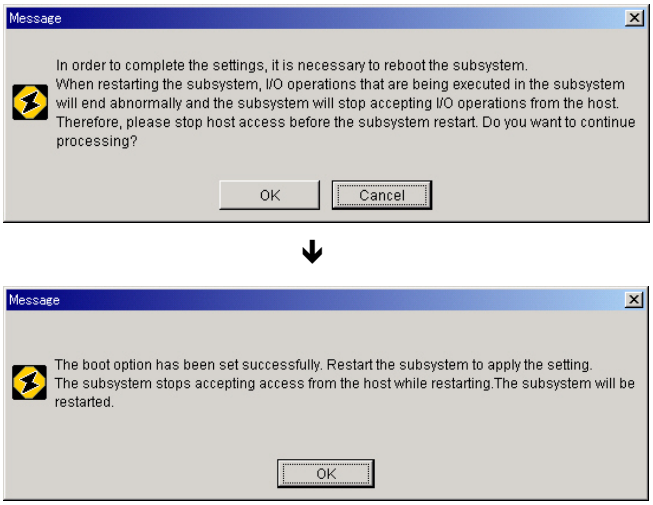
Note: If the special mode setting operation is performed for the array unit connected to the NAS unit, the cluster between the NAS Units stops. When the special mode setting operation for the array subsystem is unavoidably performed, execute it after stopping the cluster between the NAS Units and stopping the NAS OS of both NAS Units. Start the cluster between the NAS Units again after completing the special mode setting operation for the array subsystem.

1. On the **Tools** menu, select **Configuration Settings**. Alternately, click **Configuration Settings** on the tool bar.
2. Click the **Boot Option** tab.
3. For the **Drive Detach Mode**, select the **Enable** radio button:

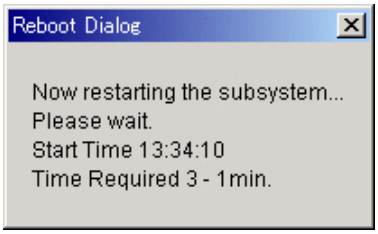


4. Click **Apply**.
5. A confirmation message box displays. Click **OK**.




Message
In order to complete the settings, it is necessary to reboot the subsystem.
When restarting the subsystem, I/O operations that are being executed in the subsystem will end abnormally and the subsystem will stop accepting I/O operations from the host. Therefore, please stop host access before the subsystem restart. Do you want to continue processing?
OK
Cancel
Message
The boot option has been set successfully. Restart the subsystem to apply the setting.
The subsystem stops accepting access from the host while restarting.The subsystem will be restarted.
OK

When restarting the array unit, the time the array unit restarts will be displayed. It takes approximately four to 15 minutes to restart the array unit.



Note: Depending on the status of array unit, the array unit may take time to respond. If the array unit does not respond after 15 minutes or more, check the status of the array unit.

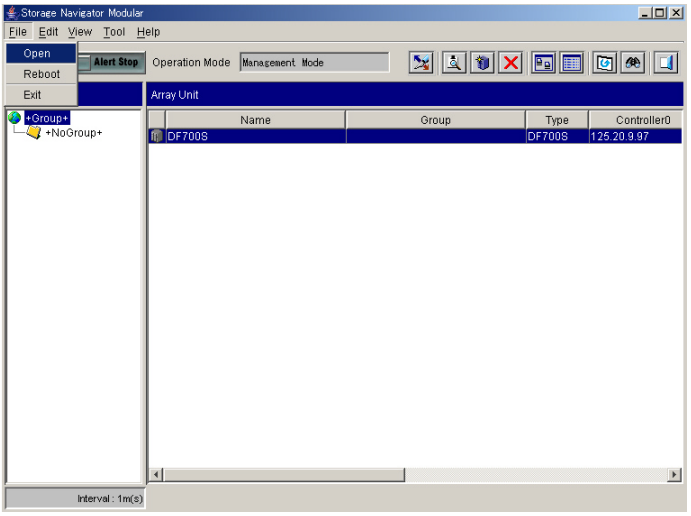
7.13 Changing the Network Parameter

Set a network parameter from the Storage Navigator-Modular.

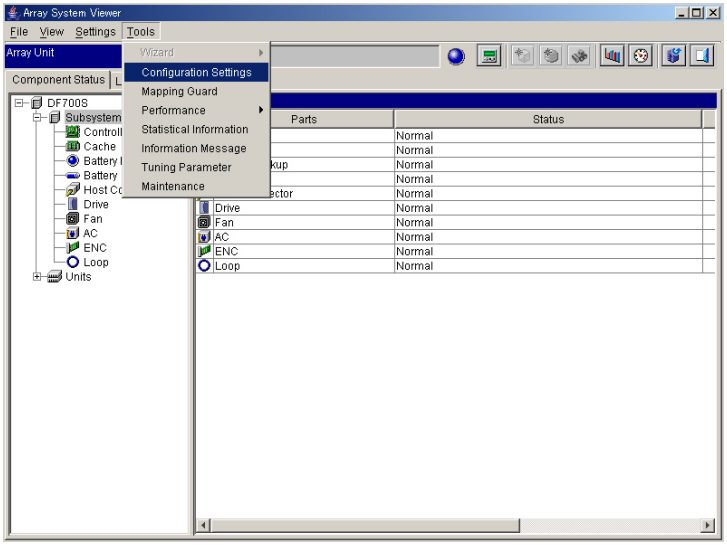
Note: If the network parameter is changed for the array unit connected to the NAS unit, the cluster between the NAS Units stops. When the network parameter for the array subsystem is unavoidably changed, execute it after stopping the cluster between the NAS Units and stopping the NAS OS of both NAS Units. Start the cluster between the NAS Units again after completing the network parameter change for the array subsystem.

To change a network parameter:

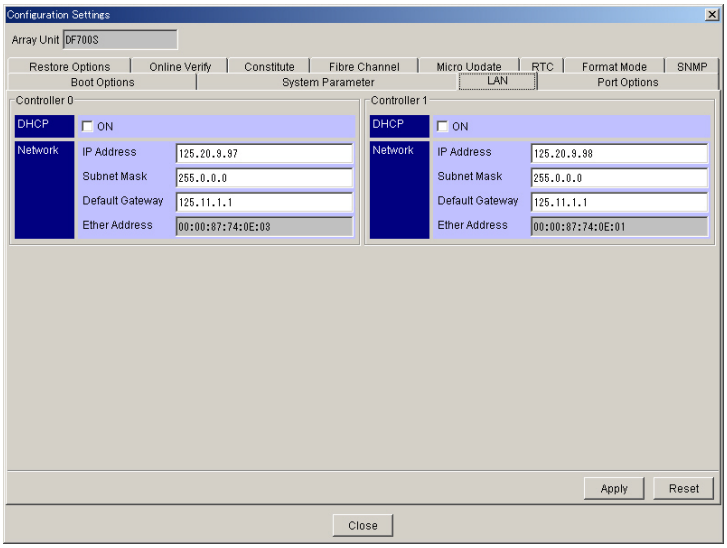
1. Turn on the power supply.
2. Start the Storage Navigator Modular and set the operation mode in **Management Mode**. Refer to the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Navigator Modular Graphical User Interface (GUI) User's Guide*.
3. Click the icon of an array unit on the Main window, and then select the **File** menu. Click **Open**. Alternatively, click **Display Details** on the tool bar:



4. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the tool bar:



5. On the **Configuration settings** screen, click the **LAN** tab:



6. Set the Network parameter for the Network.

Note: For the head value of the IP Address, ‘0’, ‘127’, ‘255’ cannot be specified. If any one of these values is set, an error will be caused when clicking the **Apply** button in the **Parameter** window.

7. Click **Apply**.

8. A confirmation message box displays. Click **OK**.

7.14 Changing the IP Address for the Maintenance Port

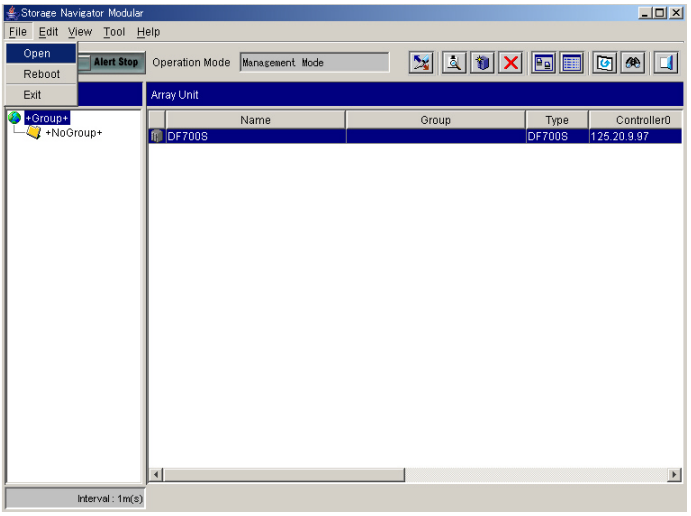
This operation is performed using the Storage Navigator Modular.

Note: The IP address for the maintenance port is used for the maintenance work performed by the maintenance personnel when a failure occurs. Keep one of the following network addresses as an address for the maintenance work; "10.0.0.xxx", "192.168.0.xxx", "192.168.233.xxx", "172.23.211.xxx", "10.197.181.xxx". Do not use this designated address for other purposes.

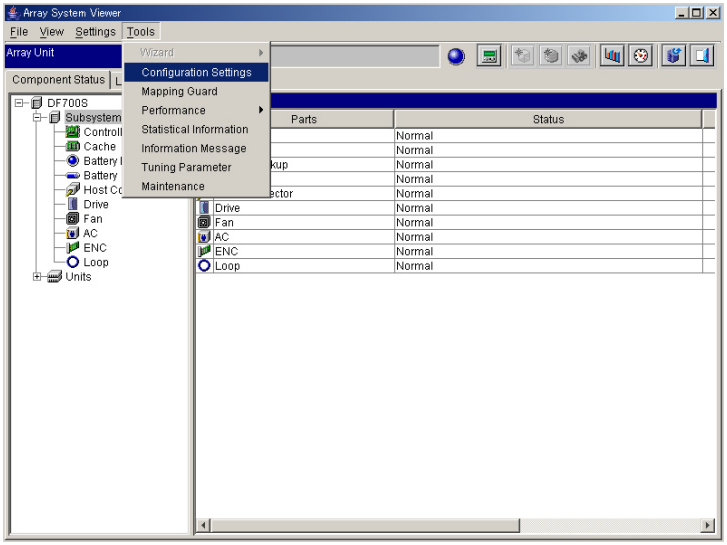
Do not change the IP address for the maintenance port, if the change is not absolutely needed.

To change the IP address for the maintenance port, follow these steps:

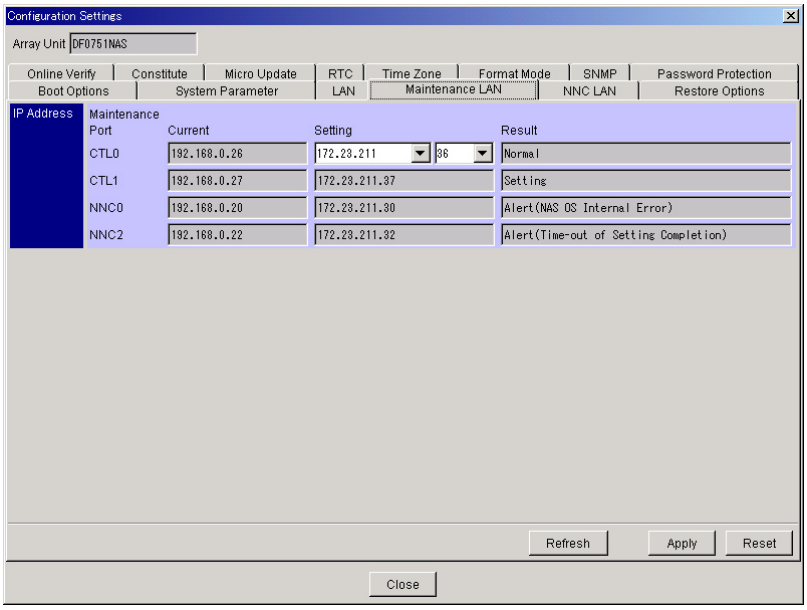
1. Turn on the power supply.
2. Start the Storage Navigator Modular and set the operation mode in **Management Mode**. Refer to the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Storage Navigator Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711).
3. Click the icon of an array unit on the Main window, and then select the **File** menu. Click **Open**. Alternatively, click **Display Details** on the tool bar:



4. From the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** on the tool bar:



5. Click the **Maintenance LAN** tab on the **Configuration Settings** screen.

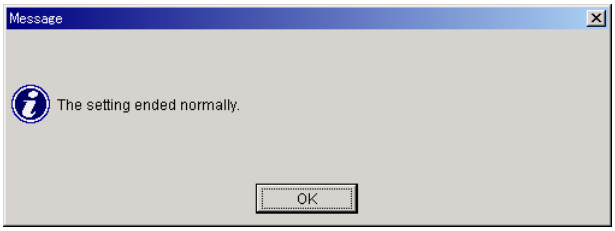


6. Set the **Maintenance LAN Information**.

Note: The IP address which has the same network address as the IP address currently set for the user-managed port or the NNC management port has cannot be set. In the event that this IP address is set, an error will occur when clicking the **Apply** on the **Parameter** screen.

7. Click the **Apply** button on the **Configuration Settings** screen after the setting is completed.

8. A confirmation message box displays. Click **OK**.



9. When all the **Current** values are the same as the set value on the **Configuration Settings** screen, and the **Normal** is displayed on the **Result**, the setting is completed.

   If the **Setting** is displayed in the **Result**, click the **Refresh** on the **Configuration Settings** screen after a brief interval.

When the setting does not terminate correctly, the following messages will be displayed in the **Result**.

No.	Display in the Result	Failure and Measure
1	---	An unexpected setting result value was received from through Storage Navigator Modular. Press the Refresh button again to refresh the display. When the display is not changed how many times the above operation repeated, make the setting again. If the same information is displayed in spite of the above operation, contact the maintenance personnel.
2	Setting	The setting is being changed. Wait for about 5 minutes, and then press the Refresh button again to refresh the display. If the same information is displayed no matter how many times the update is repeated, contact the maintenance personnel.
3	Alert (Time-out of Disconnection)	The setting could not be changed because the effective connection was set for the maintenance port. When the failure monitor service is used with the ASSIST through a maintenance port connection, contact the maintenance personnel. Except for the above case, make the setting again. If the same information is displayed in spite of the above operation, contact the maintenance personnel.
4	Alert (Internal Error)	The setting could not be changed because the processing could not continue inside the subsystem. When a failure occurs in the subsystem, contact the maintenance personnel. When no failure occurs in the subsystem, make the setting again. If the same information is displayed in spite of the above operation, contact the maintenance personnel.

No.	Display in the Result	Failure and Measure
5	Not Specified	The setting has not completed yet because the NAS unit is activating. Wait until the NAS unit becomes normal, press the Refresh button again to refresh the display. If the same information is displayed no matter how many times the update is repeated, contact the maintenance personnel.
6	Setting Reserved	The setting has not been completed because the NAS unit stops. The setting will be made when the NAS unit is restarted. Wait until the NAS unit restarts, and press the Refresh button again to refresh the display. If the same information is displayed no matter how many times the update is repeated, contact the maintenance personnel.
7	Alert (Time-out of Setting Completion)	There was no response regarding the setting from the NAS unit although a certain period of time passed. When a failure occurs in the subsystem or in the NAS unit, contact the maintenance personnel. When no failure occurs in the subsystem or in the NAS unit, make the setting again. If the same information is displayed in spite of the above operation, contact the maintenance personnel.
8	Alert (NAS OS Internal Error)	The setting could not be changed because a failure occurred inside the NAS OS. When a failure occurs in the NAS unit, contact the maintenance personnel. When no failure occurs in the NAS unit, make the setting again. If the same information is displayed in spite of the above operation, contact the maintenance personnel.
9	Alert (Time-out of Setting)	The setting could not be changed because a time out occurred inside the NAS OS during the setting. When a failure occurs in the NAS unit, contact the maintenance personnel. When no failure occurs in the NAS unit, make the setting again. If the same information is displayed in spite of the above operation, contact the maintenance personnel.
10	Alert (Segment Duplication)	The network address intended to be set has already been used for a port of the NAS unit. Set other IP address of the maintenance port. When the same information id displayed no matter which IP address is specified, set the maintenance port ID address, which has been set before the change, again, and change the duplicate IP address of the port.

7.15 Setting the System LU and User LU in the NAS System

This operation is performed using the Storage Navigator Modular. Refer to the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Navigator Modular Graphical User Interface (GUI) User's Guide*.

The capacity of system LU is restricted to the capacity listed in the following table:

Table 7.5 Capacity Restriction of System LU

No.	System LU	Capacity Restriction	
		Byte Designation	Block Designation
1	For system disk (CTL 0)	15 G bytes (or more)	27,369,141 blocks (or more)
2	For system disk (CTL 1)	15 G bytes (or more)	27,369,141 blocks (or more)
3	For volume for storing dump (CTL 0)	5 G bytes (or more)	9,619,141 blocks (or more)
4	For volume for storing dump (CTL 1)	5 G bytes (or more)	9,619,141 blocks (or more)
5	For command device (*Note*)	35 M bytes (or more)	68,360 blocks (or more)
6	For the work for storing the dump edit result.	5 G bytes (or more)	8,193,360 blocks (or more)
7	For the system sharing volume	3 G bytes (or more)	4,955,079 blocks (or more)
8	For the volume for back-upping a shared volume	3 G bytes (or more)	4,955,079 blocks (or more)
9	For the volume 2 for back-upping a shared volume	3 G bytes (or more)	4,955,079 blocks (or more)

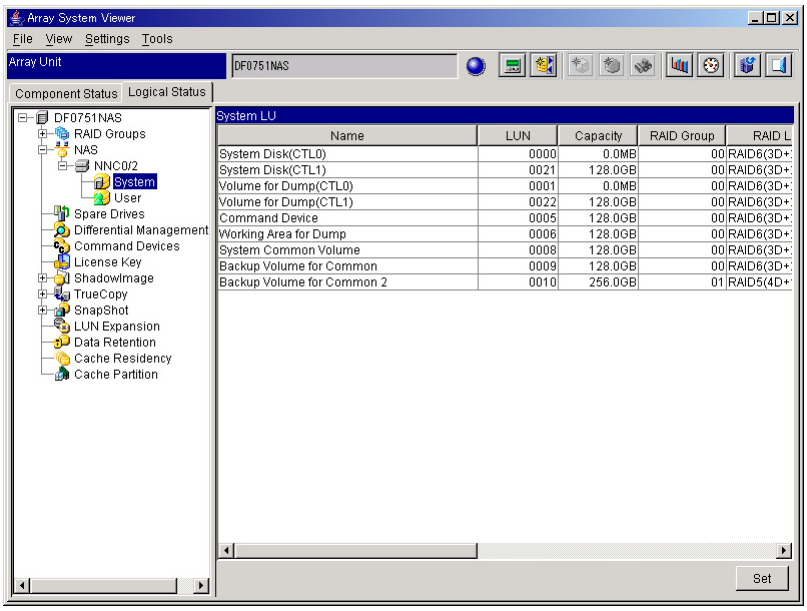
Note: It is required to use the extra-cost option such as ShadowImage in-system replication and Backup Restore.

7.15.1 Setting the System LU

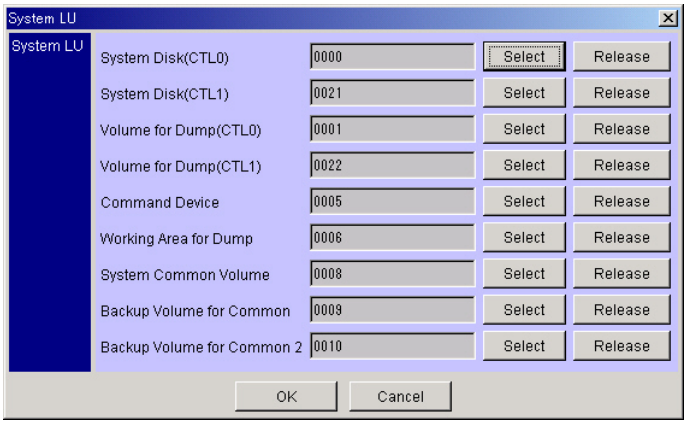
To set the System LU:

1. On the Unit screen, click the **Logical Status** tab.
2. Display the **NNC0/2** by double-clicking the **NAS**.

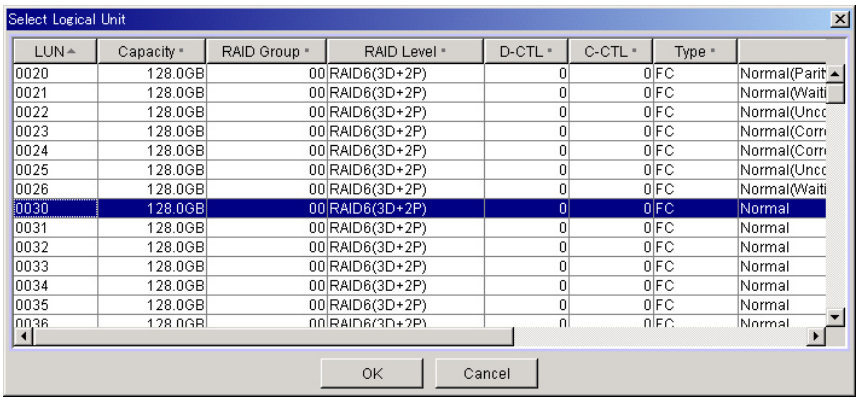
   Display the **System** and **User** by double-clicking the **NNC0/2**, and select the **System**. A list of system LU is displayed.



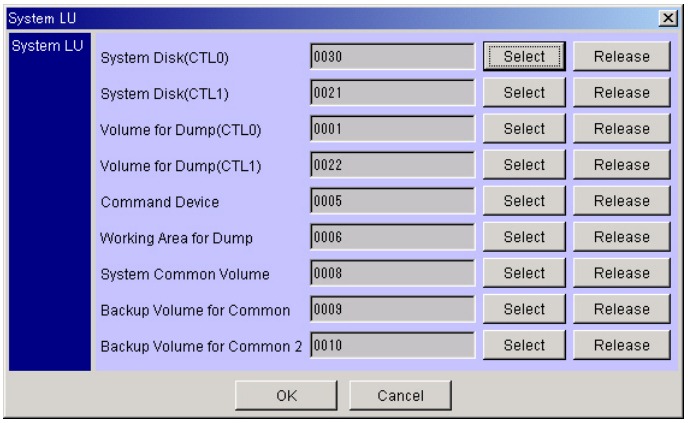
3. Click the **Set** button in the lower right portion of the screen. The **System LU** dialog box is displayed.
4. Click the **Select** button for the system LU that you want to set.


System LU
System LU
System Disk(CTL0) 0000 Select Release
System Disk(CTL1) 0021 Select Release
Volume for Dump(CTL0) 0001 Select Release
Volume for Dump(CTL1) 0022 Select Release
Command Device 0005 Select Release
Working Area for Dump 0006 Select Release
System Common Volume 0008 Select Release
Backup Volume for Common 0009 Select Release
Backup Volume for Common 2 0010 Select Release
OK
Cancel

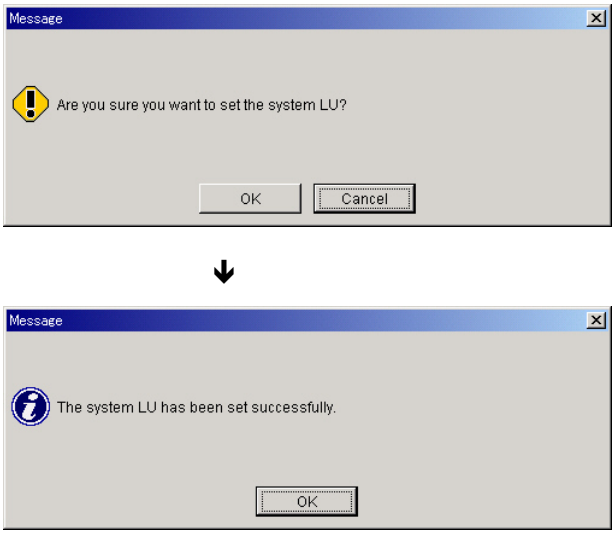
5. The Select Logical Unit dialog box is displayed.
   Select the LUNs to be assigned, click the **OK** button.


Select Logical Unit
LUN
Capacity
RAID Group
RAID Level
D-CTL
C-CTL
Type
0020 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal(Parit
0021 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal(Waiti
0022 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal(Unco
0023 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal(Corr
0024 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal(Corr
0025 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal(Unco
0026 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal(Waiti
0030 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal
0031 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal
0032 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal
0033 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal
0034 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal
0035 128.0GB 00 RAID6(3D+2P) 0 0 FC Normal
OK
Cancel

6. Verify that the selected LU(s) was(were) reflected to the System LU dialog box, and click the **OK** button.


System LU
System LU
System Disk(CTL0) 0030 Select Release
System Disk(CTL1) 0021 Select Release
Volume for Dump(CTL0) 0001 Select Release
Volume for Dump(CTL1) 0022 Select Release
Command Device 0005 Select Release
Working Area for Dump 0006 Select Release
System Common Volume 0008 Select Release
Backup Volume for Common 0009 Select Release
Backup Volume for Common 2 0010 Select Release
OK
Cancel

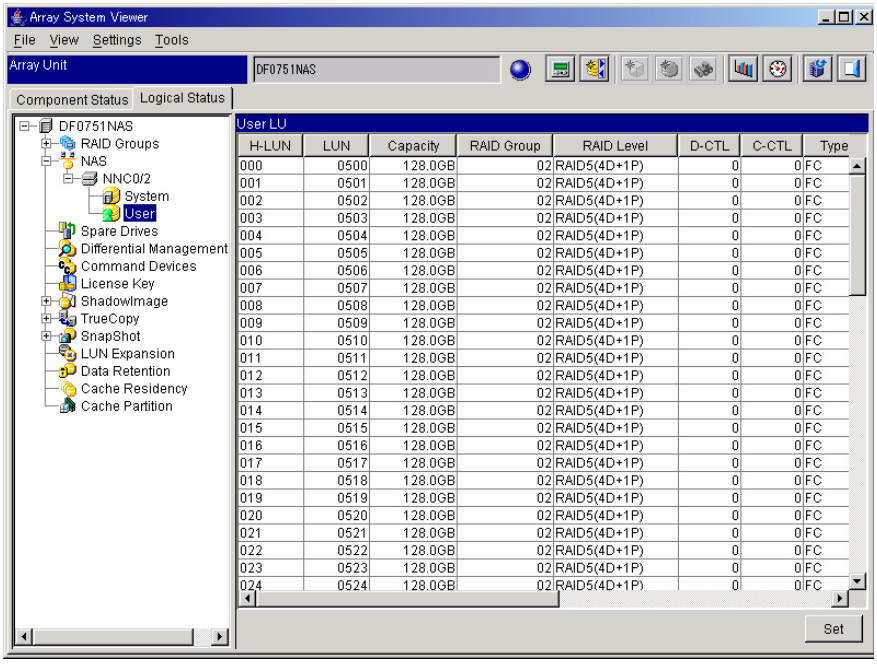
7. A confirmation message appears, click the **OK** button.



7.15.2 Setting the User LU

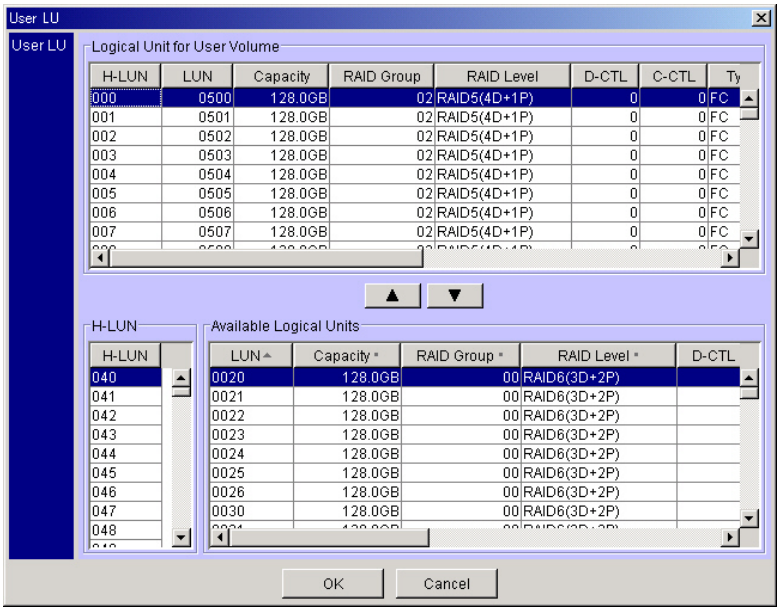
To set the User LU:

1. On the Unit screen, click the **Logical Status** tab.
2. Display the **NNC0/2** by double-clicking the **NAS**.
   Display the **System** and **User** by double-clicking the **NNC0/2**, and select the **User**.
   A list of system LU is displayed.


Array System Viewer
File View Settings Tools
Array Unit
DF0751NAS
Component Status
Logical Status
DF0751NAS
RAID Groups
NAS
NNC0/2
System
User
Spare Drives
Differential Management
Command Devices
License Key
ShadowImage
TrueCopy
SnapShot
LUN Expansion
Data Retention
Cache Residency
Cache Partition
User LU
H-LUN LUN Capacity RAID Group RAID Level D-CTL C-CTL Type
000 0500 128.0GB 02 RAID5(4D+1P) 0 0 FC
001 0501 128.0GB 02 RAID5(4D+1P) 0 0 FC
002 0502 128.0GB 02 RAID5(4D+1P) 0 0 FC
003 0503 128.0GB 02 RAID5(4D+1P) 0 0 FC
004 0504 128.0GB 02 RAID5(4D+1P) 0 0 FC
005 0505 128.0GB 02 RAID5(4D+1P) 0 0 FC
006 0506 128.0GB 02 RAID5(4D+1P) 0 0 FC
007 0507 128.0GB 02 RAID5(4D+1P) 0 0 FC
008 0508 128.0GB 02 RAID5(4D+1P) 0 0 FC
009 0509 128.0GB 02 RAID5(4D+1P) 0 0 FC
010 0510 128.0GB 02 RAID5(4D+1P) 0 0 FC
011 0511 128.0GB 02 RAID5(4D+1P) 0 0 FC
012 0512 128.0GB 02 RAID5(4D+1P) 0 0 FC
013 0513 128.0GB 02 RAID5(4D+1P) 0 0 FC
014 0514 128.0GB 02 RAID5(4D+1P) 0 0 FC
015 0515 128.0GB 02 RAID5(4D+1P) 0 0 FC
016 0516 128.0GB 02 RAID5(4D+1P) 0 0 FC
017 0517 128.0GB 02 RAID5(4D+1P) 0 0 FC
018 0518 128.0GB 02 RAID5(4D+1P) 0 0 FC
019 0519 128.0GB 02 RAID5(4D+1P) 0 0 FC
020 0520 128.0GB 02 RAID5(4D+1P) 0 0 FC
021 0521 128.0GB 02 RAID5(4D+1P) 0 0 FC
022 0522 128.0GB 02 RAID5(4D+1P) 0 0 FC
023 0523 128.0GB 02 RAID5(4D+1P) 0 0 FC
024 0524 128.0GB 02 RAID5(4D+1P) 0 0 FC
Set

3. Click the **Set** button in the lower right portion of the screen.
   The **User LU** dialog box is displayed.

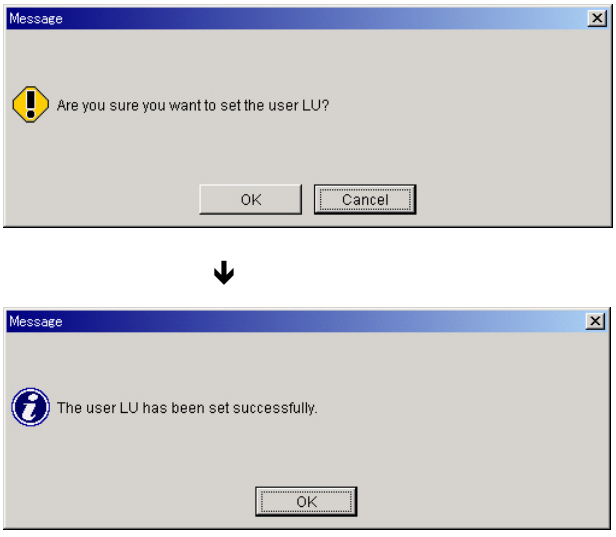
4. Select one H-LUN from the **H-LUN** list in the User LU dialog box, select an LUN that you want to assign for the H-LUN from the **Available Logical Units** list, and click ▲ button.



The selected H-LUN and LUN will be moved to the **Logical Unit for User Volume** list.

5. Repeat step 4 until all the LUNs that you want to assign are moved to the **Logical Unit for User Volume**, click the **OK** button.

6. A confirmation message appears, click the **OK** button.

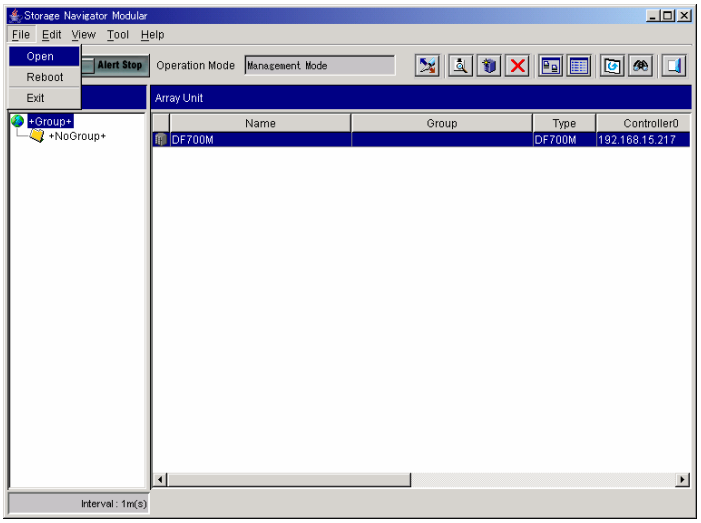


7.16 Setting the NNC Management LAN Port Information in the NAS System

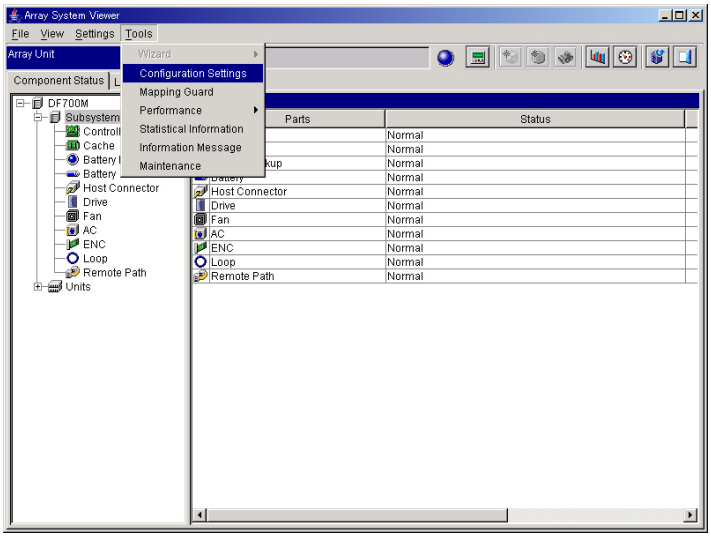
This operation is performed using the Storage Navigator Modular.

To set the NNC management port in the network, follow these steps:

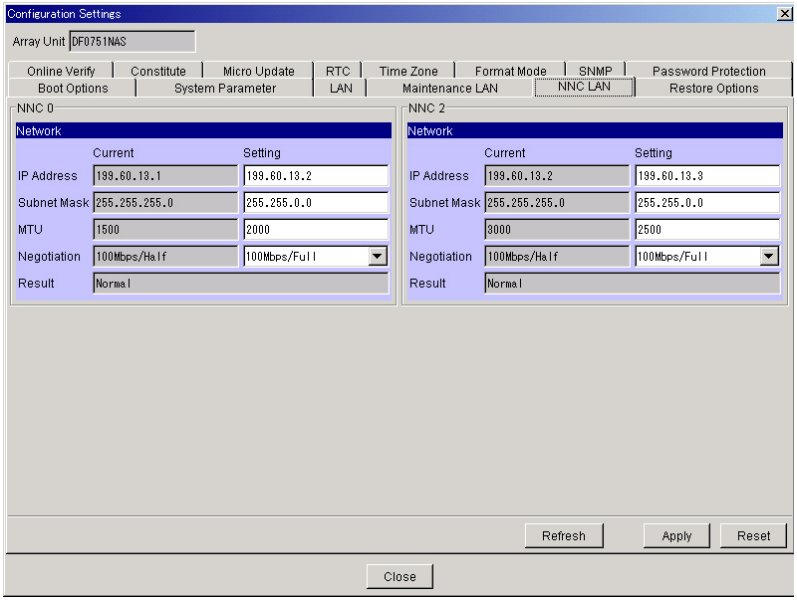
1. Turn on the power supply.
2. Start the Storage Navigator Modular and set the operation mode in the **Management Mode** (Refer to the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Navigator Modular Graphical User Interface (GUI) User's Guide*.
3. Click the icon of an array unit on the Main screen, and then select the **File** menu, click **Open**. Or, click the **Display Details** button in the tool bar.



4. On the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** in the tool bar.



5. Click the **NNC LAN** tab on the **Configuration Settings** screen.



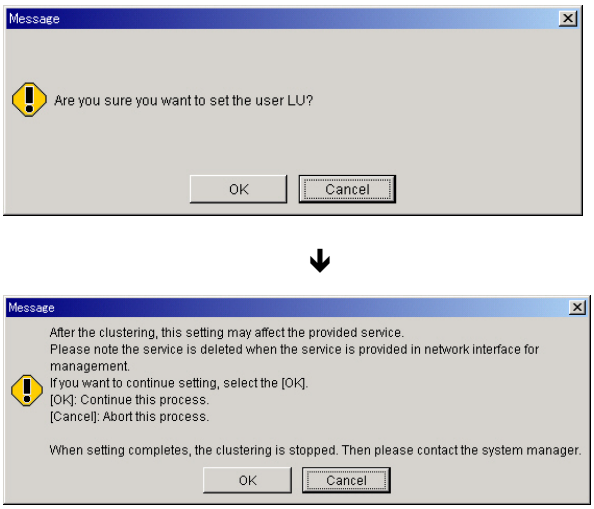
6. Set the **LAN Information**.

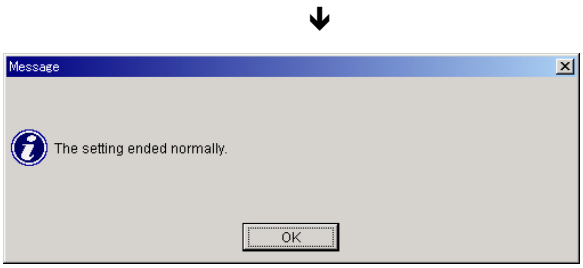
   LAN information: Refer to and set the network setting of NNC management port.

   - **IP Address:** Displays the current value of IP address and specifies the setting value.
   - **Subnet Mask:** Displays the current value of subnet mask and specifies the setting value.
   - **MTU:** Displays the current value of MTU and specifies the setting value. The setting value can be specified in the range of 1500 to 16110.
   - **Negotiation:** Displays the current value of Negociation and specifies s the setting value.

7. Click the **Apply** button on the **Configuration Settings** screen after the setting is completed.

8. A confirmation message appears, click the **OK** button.


Message
Are you sure you want to set the user LU?
OK
Cancel
Message
After the clustering, this setting may affect the provided service.
Please note the service is deleted when the service is provided in network interface for management.
If you want to continue setting, select the [OK].
[OK]: Continue this process.
[Cancel]: Abort this process.
When setting completes, the clustering is stopped. Then please contact the system manager.
OK
Cancel


Message
The setting ended normally.
OK

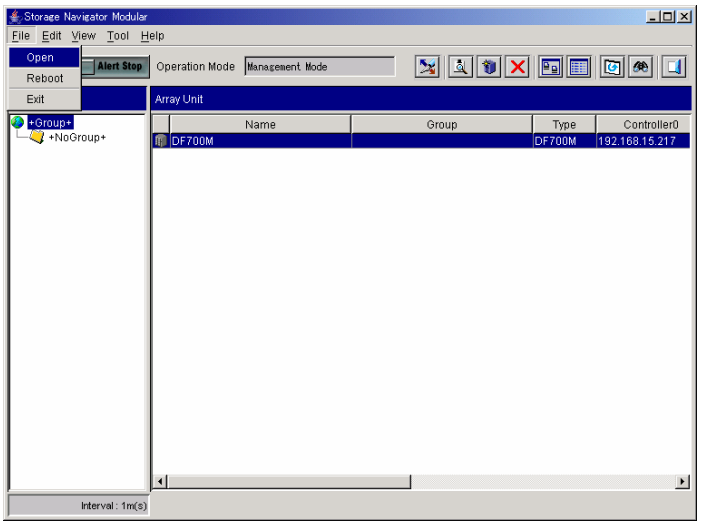
7.17 Setting the Time Zone

This operation is performed using the Storage Navigator Modular.

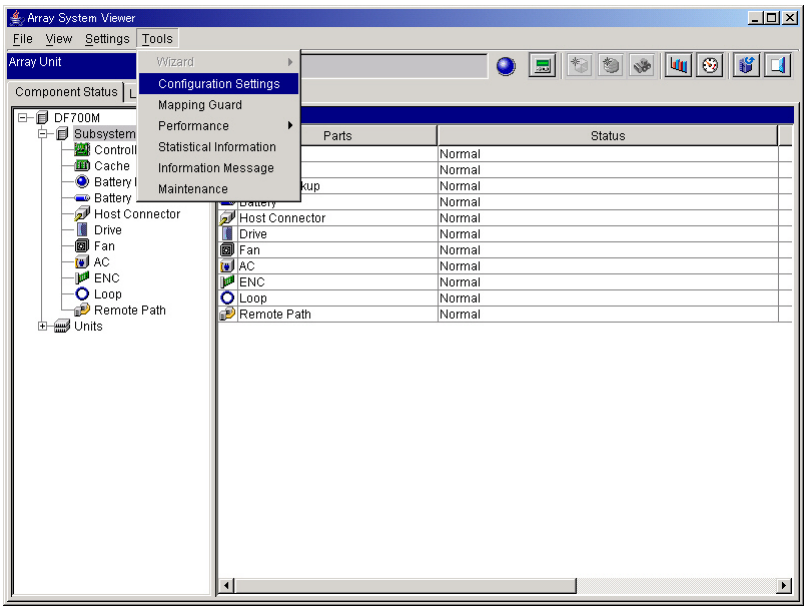
When connecting the NAS unit, this operation is necessary. This operation is not necessary after the NAS unit is connected. If an NTP server is onsite and you wish to synchronize the clock of the array unit to the NTP server, execute this operation.

To set the time zone, follow these steps:

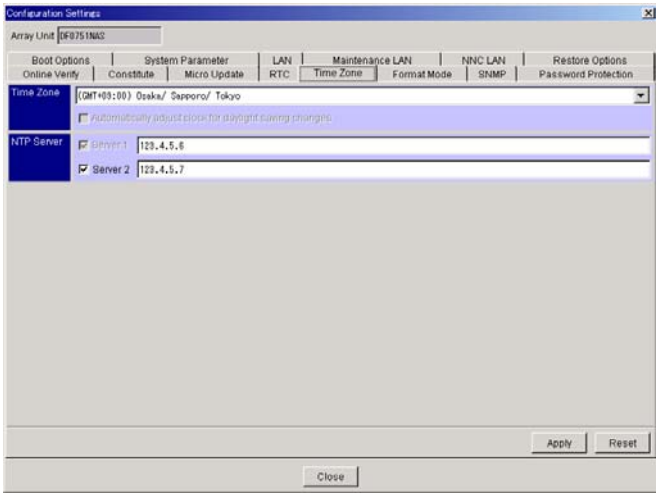
1. Turn on the power supply.
2. Start the Storage Navigator Modular and set the operation mode in **Management Mode.** Refer to the *Acer | HDS Adaptable Modular Storage and Workgroup Modular Storage Navigator Modular Graphical User Interface (GUI) User's Guide*.
3. Click the icon of an array unit on the Main window, then select the **File** menu. Click Open. Alternatively, click the **Display Details** button in the tool bar.



4. On the **Tools** menu, select **Configuration Settings** or click **Configuration Settings** in the tool bar.



5. Click the **Time Zone** tab on the **Configuration Settings** screen.

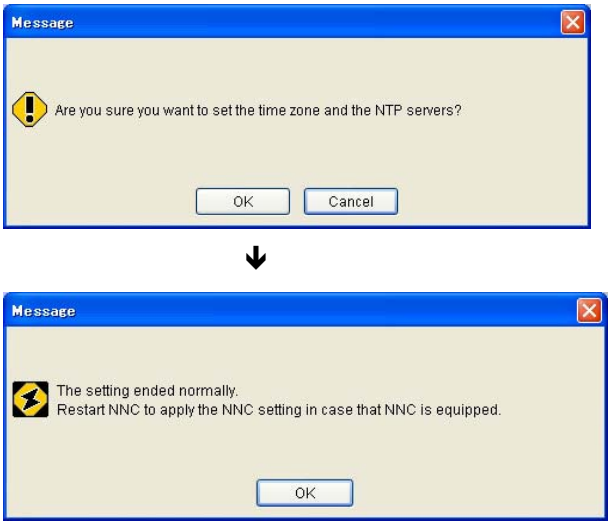


6. Set the IP addresses of **Time Zone** and **NTP Server**.
   - **Time Zone**: Refers to and sets the time zone.
     Default value: (GMT+09:00) Osaka/ Sapporo/ Tokyo
     Automatically adjust clock for daylight saving changes: Specifies whether to use the summer time.
   - **NTP Server**: Refers to and sets the IP address of the NTP server.

Note: Input is surely required for Server 1. Input is not indispensable to Server 2 because Server 2 is for standby.

7. Click the **Apply** button on the **Configuration Settings** screen after the setting is completed.
8. A confirmation message appears, click the **OK** button.

Note: When the NAS OS stops, or is not installed, click the **Cancel** button.


Message
Are you sure you want to set the time zone and the NTP servers?
OK
Cancel
Message
The setting ended normally.
Restart NNC to apply the NNC setting in case that NNC is equipped.
OK

Chapter 8 Troubleshooting

This chapter includes the following:

- Troubleshooting Based on LED Indications
- Web Overview
- Web Operational Procedures
- Troubleshooting Using a Web Connection
- Determining Failure of Network Side in the NAS System
- Collecting Failure Information in Connection with Web
- Determining Failure on the Network Side of an iSCSI System
- Calling the Acer | HDS Support Center

This chapter provides information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide an explanation for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
8.1	8.1.1 The POWER LED Does Not Turn On	○	○	○
	8.1.2 The POWER LED Has Turned off	○	○	○
	8.1.3 If the READY LED Does Not Turn on, or the READY LED Has Turned on Once and then Turned off	○	○	○
	8.1.4 The Alarm LED Has Turned on	○	○	○
	8.1.5 The WARNING LED Has Turned on or Blinks	○	○	○
8.2	8.2.1 Operational Environment	○	○	○
	8.2.2 Characteristics of Network Functions	○	○	○
8.3	8.3.1 Connecting to the Network using a LAN Interface	○	○	○
	8.3.2 Screen Outlines	○	○	○
	8.3.3 Main Screen in Normal Mode	○	○	○
	8.3.4 Status Display of Replaceable Components	○	○	○
	8.3.5 Information Message	○	○	○
	8.3.6 Setting the Buzzer Sound Volume	○	○	○
	8.3.7 Clear Specified Factors of NNC Partial Alarm	–	○	–
8.4	8.4.1 Checking Subsystem Status	○	○	○
	8.4.2 Checking the Progress Condition Display	○	○	○
	8.4.3 Checking Component Status	○	○	○
	8.4.4 Checking Log Messages	○	○	○
	8.4.5 Troubleshooting Using Messages	○	○	○
	8.4.6 Reading Failure Information	○	○	○
8.5	Determining Failure of Network Side in NAS System	–	○	–
8.6	8.6.1 Collecting Simple Trace	–	○	—
	8.6.2 NAS Log Collection	–	○	—
	8.6.3 NAS Dump generation	–	○	—
8.7	Determining Failure of Network Side in iSCSI system	–	–	○

○: An explanation is provided.
—: An explanation is not provided.

8.1 Troubleshooting Based on LED Indications

This section includes the following:

- The POWER LED does not turn on
- The POWER LED is turned off
- The READY LED does not turn on or the READY LED has turned on once, and then turned off
- The ALARM LED has turned on
- The WARNING LED has turned on or blinks

Note: If the array subsystem connected to the NAS Unit is restarted, the cluster between the NAS Units stops. When the array subsystem is unavoidably restarted, execute it after stopping the cluster between the NAS Units and stopping the NAS OS of both NAS Units. Start the cluster between the NAS Units again after completing the restart for the array subsystem.

Note: There is a case where a NAS system cannot be accessed from a host computer even though the READY LED of NAS unit illuminates. A NAS system accepts access from a host computer only in case of "ACTIVE" NAS OS Condition.

8.1.1 The POWER LED Does Not Turn on

When the POWER LED does not turn on, follow these steps:

1. Set all the AC power unit switches on; set the main switch to on.
2. Is the POWER LED on the RKS on?

   Yes: Go to step 11.

   No: Power on the host computer.
3. Is the POWER LED on the RKS on?

   Yes: Go to step 11.

   No: Set the main switch to off; set the AC power unit switch to off.
4. Check the PDB to verify that electricity is supplied to the unit.
5. Verify that the AC cable is correctly connected to the plug socket and the equipment.
6. Set all the AC power unit switches to on; set the main switch to on.
7. Is the POWER LED on the RKS on?

   Yes: Go to step 11.

   No: Set the main switch to off; set the AC power unit switch to off.
8. Call your Customer Engineer. Go to step 11.

9. Is the READY LED on the RKS (and RKNAS) on?

   Yes: Continue to use the equipment in its current operational state . When the READY LED (green) blinks continuously, it blinks for up to 15 minutes because the download of the ENC/SENC firmware is executed. The subsystem is operational even though the READY LED (green) is blinking.

   No: Verify that READY LED does not turn on, or that READY LED has turned on once and then turned off.

10. Is the RKNAS connected?

    Yes: If the POWER LED on the RKNAS does not light, set the AC power unit switch of the RKNAS to off, and call the Engineer.

    No: Go to step 11.

11. End of the procedure.

8.1.2 The POWER LED Turned Off

When the POWER LED has turned off, follow these steps:

1. Is electricity supplied to the equipment?

   Yes: Go to step 2.

   No: Supply electricity to the unit, and then restart the unit. Go to step 2.

2. Verify that the AC cable is correctly connected to the plug socket.
3. Set the main switch to off, then set all the AC power unit switches to off.
4. After waiting for more than one minute, set all the AC power unit switches to on, then set the main switch to on.
5. Has the POWER LED on the RKS turned on?

   Yes: Go to step 7.

   No: Set the main switch to off, then set the AC power unit switch to off.

6. Call your Customer Engineer. Go to step 9.
7. Has the READY LED on the RKS turned on?

   Yes: Continue to use the equipment in its current operational state . When the READY LED (green) blinks continuously, it blinks for up to 15 minutes because the download of the ENC/SENC firmware is executed. The subsystem is operational even though the READY LED (green) is blinking, continue to use the equipment as it is.

   No: Refer to section 8.1.3.

8. Is the RKNAS connected?

   Yes: If the POWER LED on the RKNAS does not light, set the AC power unit switch of the RKNAS to off, and call your Customer Engineer.

   No: Go to step 9.

9. End of the procedure.

8.1.3 If the READY LED Does Not Turn On or has Turned On Once then Off

If the READY LED does not turn on, or the READY LED has turned on once and then turned off, follow these steps:

1. Is the POWER LED on the RKS on?

   Yes: Go to step 2.

   No: Go to step 4 in **The POWER LED Does Not Turn on**.

2. Is the ALARM LED on the RKS on?

   Yes: Refer to: **The ALARM LED Has Turned on**.

   No: Go to step 3.

3. Is the RKNAS connected?

   Yes: Go to step 4.

   No: Go to step 5.

4. Is the POWER LED on the RKNAS is on? And is the ALARM LED on the RKNAS off?

   Yes: Go to step 5.

   No:

   - If the POWER L ED on the RKNAS is not on, go to step 4 in **The POWER LED Does Not Turn on**.
   - If the ALARM LED on the RKNAS is on, refer to **The ALARM LED Has Turned on**.

5. Turn off the main switch.

6. After waiting for more than one minute, set the AC power unit switch to on, and then set the main switch to on.

7. Has the READY LED on the RKS turned on?

   Yes: Continue to use the equipment in its current operational state . When the READY LED (green) on the RKS blinks continuously, it blinks for up to 15 minutes because the download of the ENC/SENC firmware is executed. The subsystem is operational even though the READY LED (green) on the RKS is blinking.

   Go to step 12.

   No: Go to step 8.

8. Set the main switch to off, then set the AC power unit switch to off.

9. Is the RKNAS connected?

   Yes: Go to step 10.

   No: Go to step 11.

10. Is the READY LED on the RKNAS on?

    Yes: Go to step 12.

    No: Set the AC power unit switch of the RKNAS to off.

11. Call your Customer Engineer.
12. End of the procedure

8.1.4 The Alarm LED Turned On

When the ALARM LED has turned on, follow these steps:

1. Identify in which components the failure resides.

   Note: Refer to section 4.7.5 to identify failed components whose LEDs indicate their respective failures.

2. Call your Customer Engineer and allow the equipment to remain in the present state.

8.1.5 The WARNING LED has Turned on or Blinks

When the WARNING LED has turned on or blinks, follow these steps:

1. Does the WARNING LED on the RKM blink?

   Yes: Call your Customer Engineer. Go to step 10.

   No: Go to step 2.

2. Is RKNAS connected?

   Yes: Go to step 3.

   No: Go to step 4.

3. Does the WARNING LED on the RKNAS blink?

   Yes: Call your Customer Engineer. Go to step 5.

   No: Go to step 4.

4. Is the READY LED on the RKM on?

   Yes: Go to step 5.

   No: Refer to section 8.1.3.

5. Is the RKNAS connected?

   Yes: Go to step 6.

   No: Go to step 7.

6. Is the READY LED on the RKNAS on?

   Yes: Go to step 7.

   No: Refer to section 8.1.3.

7. Identify in which components a failure resides in the RKM.

   Note: Refer to section 4.7.5 to identify failed components whose LEDs indicate their respective failures.

8. Is the RKNAS connected?

   Yes: Identify in which components a failure resides in the RKNAS.

   No: Go to step 10.

9. Continue to use the equipment, and contact the Customer Engineer.

10. End of the procedure.

8.1.6 The WARNING LED Has Turned On or Blinks

When the WARNING LED has turned on or blinks, follow these steps:

1. Does the WARNING LED blink?

   Yes: Call your Customer Engineer. Go to step 5.

   No: Go to step 2.

2. Is the READY LED on?

   Yes: Go to step 3.

   No: Refer to section 8.1.3.

3. Identify in which components a failure resides.

   Note: Refer to section 4.7.5 to identify failed components whose LEDs indicate their respective failures.

4. Continue to use the equipment and contact the Customer Engineer.

5. End of the procedure

8.2 Web Overview

This section includes the following:

- Operational environment
- Characteristics of network functions

8.2.1 Operational Environment

The Web operational environment and the necessary requirements are shown in the following tables.

Table 8.1 Web Operational Environment

No.	Item	Description
1	OS	Microsoft® Windows® 98/NT 4.0/2000/XP/2003, Solaris™ 8, IRIX 6.5.
2	PC	Pentium® (Pentium® II(233 M Hz or more) is recommended), Memory 40 M bytes or more (64 M bytes or more is recommended).
3	WS	Turbo Sparc 170 M Hz, Memory 256 M bytes or more R10000 195M Hz, Memory 128 M bytes or more.
4	Disk requirement	50 M bytes.

Table 8.2 AMS200 WEB Function Supported Browser/Version

No.	Platform	OS	Version	Browser	Version (see *Note*)	System Version : 0730/A-S	
						Supported or Not Supported	Java™ Applet Supported/Not supported (see *Note2* and*Note3)*
1	WS	IRIX	6.5	Netscape Navigator®	4.76	○	×
		Solaris™	2.6	Netscape Navigator®	4.76	○	×
			8	Netscape Navigator®	4.76	○	×
2	PC	Windows®	98	Internet Explorer	6.0	○	○
			NT/2000	Internet Explorer	6.0	○	○
			XP	Internet Explorer	6.0	○	×
			2003(IA32)	Internet Explorer	6.0	○	○
			2003(IA64)	Internet Explorer	6.0	○	×
					6.0 (32Bit)	○	○
3	PC	Windows®	98	Netscape Navigator®	7.1 (J)	○	×
					7.2 (E)	○	×
			NT/2000/ XP	Netscape Navigator®	7.1 (J)	○	×
					7.2 (E)	○	×
			2003	Netscape Navigator®	7.1 (J)	○	×
			(IA32/IA64)		7.2 (E)	○	×

O: Supported
X: Not Supported

Note: Service Pack 1 is included.

Notes on the Supported Browser:

For Windows® 2003, the strict security level is set by default; therefore, the Web function is disabled. Change the security setting to enable the browser by following these steps:

1. On the browser (Internet Explorer), click the **Tools** menu and click the **Internet Options**.
2. Click the **Security** tab, and then click **Custom Level**.
3. Specify **Medium** or lower for the **Custom Setting Reset** and click **Reset**.

Specifying a **Medium** setting solves the problem. However, if you want to use Windows® 2003 and leave the security level as **High**, make the following settings for detailed items of the **Custom Level**:

- Enable **Active scripting** of Scripting.
- Enable **Allow META REFRESH** of Miscellaneous.
- Enable **File download** of Downloads.
- Enable **Run ActiveX controls and plug-ins** of ActiveX controls and plug-ins.

- A new line may be started in a window depending on the setting of the browser. In this situation, make the character size smaller.

  < Method of character size change >

  For Internet Explorer: Select a middle or smaller size for the character size in the display.

  For Netscape Navigator®: Select the Reduction of Font Size in the Display and keep it selected until paragraphs are easily readable.

- An empty dialogue box may be displayed during operation in the Maintenance mode. In this situation, close the window by clicking on the "x" in the upper left corner of the dialogue box. Restart the browser, then retry from the entry of the URL.

- When a window size is changed while a page is displayed by Netscape®, the succeeding operation in Refresh mode may not be completed normally. In this situation, display the page again by clicking the Re-Display button.

- When using Netscape®:
  Memory cache: 1024 k bytes (default) or larger
  Disk cache: 7680 k bytes (default) or larger

  < Method of cache size setting >

  Select the Edition, Setting, Details, and Cache in this order.
  Specify sizes of the memory cache and disk cache.

- When obtaining trace information etc. with Netscape®, a sub-screen which specifies the file download destination may not automatically close.
  In this situation, press the close button on the upper right corner of the sub-screen to close the sub-screen after the download is complete.

- When using Netscape Navigator® 7.x, select Edit-Preference...-Advanced-HTTP Networking, and set Use HTTP 1.0 in the Direct Connection Options and Proxy Connection Options. When this setting is omitted, the summary window is not displayed correctly.

- When collecting memory dump (Full Dump) using Netscape Navigator® 4.7x, pay attention to free space on the PC because information to be downloaded will not be compressed.

8.2.2 Characteristics of Network Functions When Connecting with the Web

This section discusses the following network function characteristics when connecting with the Web:

- **LAN Interface**

  The connector for 10Base-T/100Base-TX is equipped with the controller. 10Base-T/100Base-TX is selected automatically.

- **Network Parameter**

  The AMS200 has the following network parameters; they can be set or changed by the Web browser or the Storage Navigator-Modular, concerning only port 1 (for user management) of each controller.

Table 8.3 Network Parameters

Network Parameter	Description	Factory Setting Value (see *Note 1*)	
		Controller 0	Controller 1
		For User-managed Port	For User-managed Port
IP Address	The IP Address is changed/set up.	192.168.0.16 (see *Note 1*)	192.168.0.17 (see *Note 1*)
Subnet Mask	The Subnet Mask is changed/set up.	255.255.255.0 (see *Note 3*)	255.255.255.0 (see *Note 3*)
Default Gateway	The Default Gateway is changed/set up.	0.0.0.0	0.0.0.0
DHCP (see *Note 2*)	Enable/Disable of the DHCP function is set up.	Off	Off

Note 1: Manage the IP Address after the IP Address is changed from the IP Address of factory setting.

Note 2: When the DHCP mode is validated, the IP Address is acquired from the DHCP server. If the DHCP server is not started up, or if the DHCP function has been wrongly set, the acquisition of the IP Address will fail, and the IP Address of the subsystem will remain 0.0.0.0. (This is a state in which Disk Array management program 2 or the Web cannot be used via a LAN.)

Note 3: In this case, you can acquire the IP Address by starting up the DHCP server or by setting the DHCP function correctly, when necessary.

8.3 Web Operational Procedures

This section contains the following information:

- Connecting to the network using a LAN interface.
- Screen outlines.
- Main screen in normal mode.
- Status display of replaceable components.
- Information message.
- Setting the buzzer sound volume.

8.3.1 Connecting to the Network using a LAN Interface

To use a LAN interface, follow these steps:

- The connector for 10Base-T/100Base-TX is equipped with the controller. 10Base-T/100Base-TX is selected automatically.
- Connect the LAN cable with the LAN connector shown in Figure 8.1.

The following figure is an example, illustrating when the FC interface board is not added to the control unit.

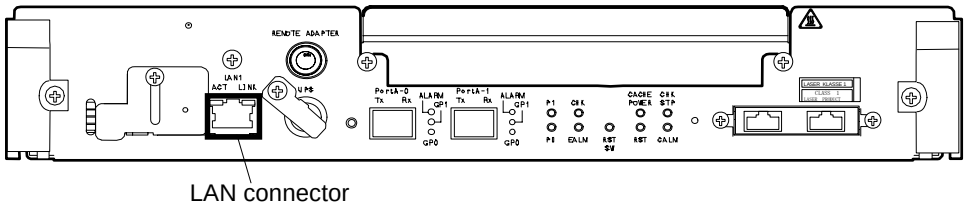


Figure 8.1 LAN Connector Location

Change the IP Address of the controller set up to the Address of the Web browser, to enter Normal Mode. Set the IP Address of the controller connected with the network as a dual system configuration. The status of the devices (both controllers) can be monitored from one controller.

8.3.2 Screen Outlines

If the Normal Mode function is displayed and clicked in the menu screen, the chosen function can be executed. The following figure displays the main screen outline of Normal Mode.

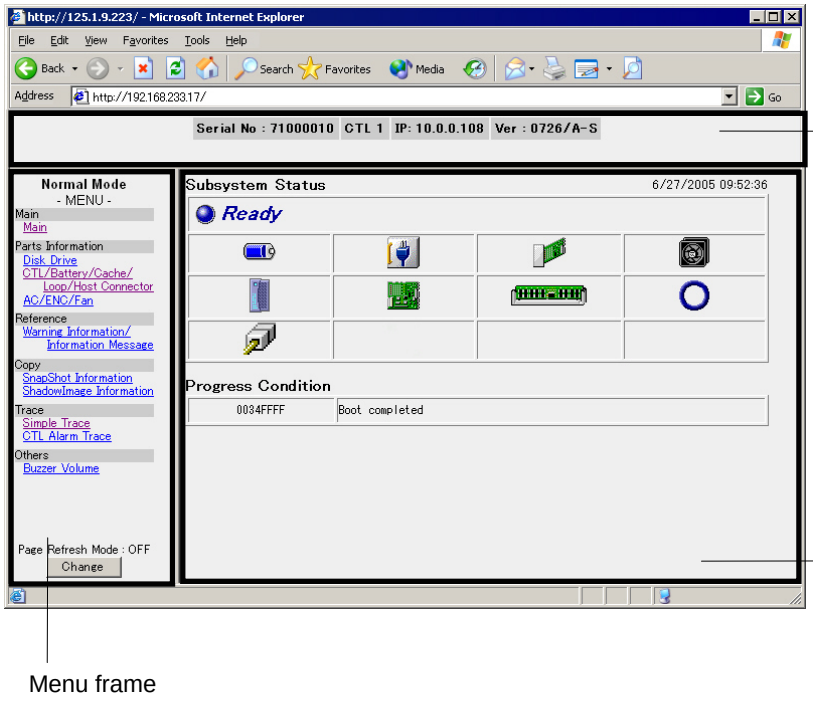


Figure 8.2 Main Screen Outline

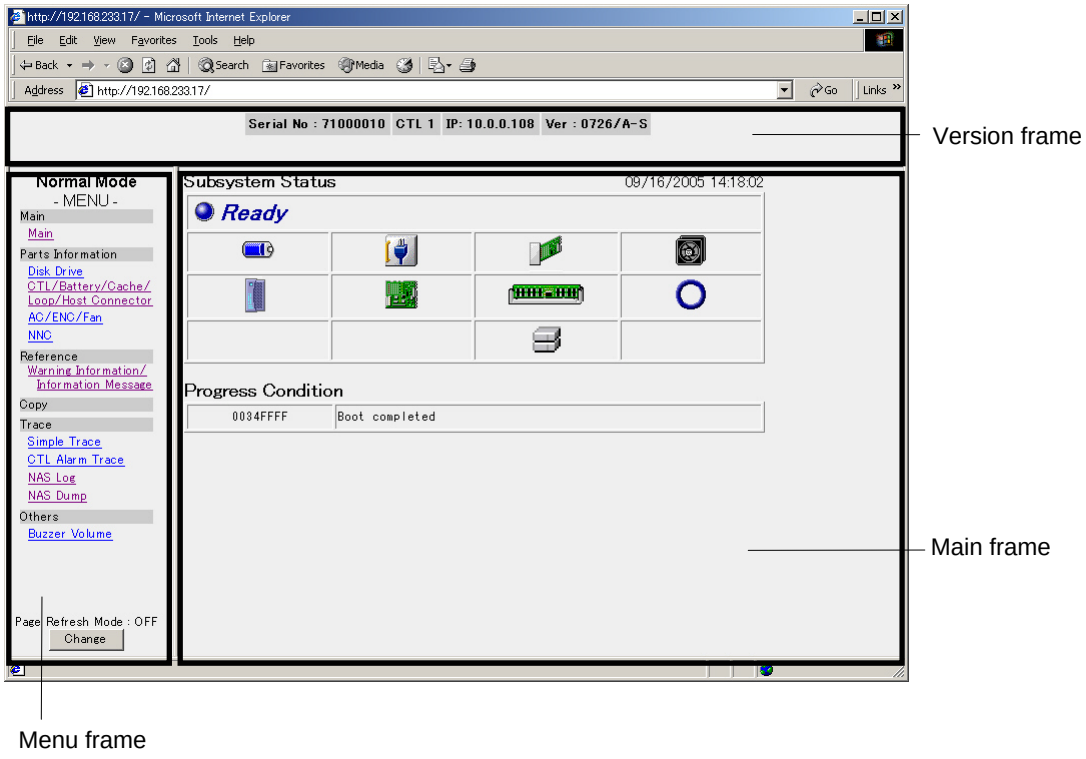


Figure 8.3 Main Screen Outline (NAS)

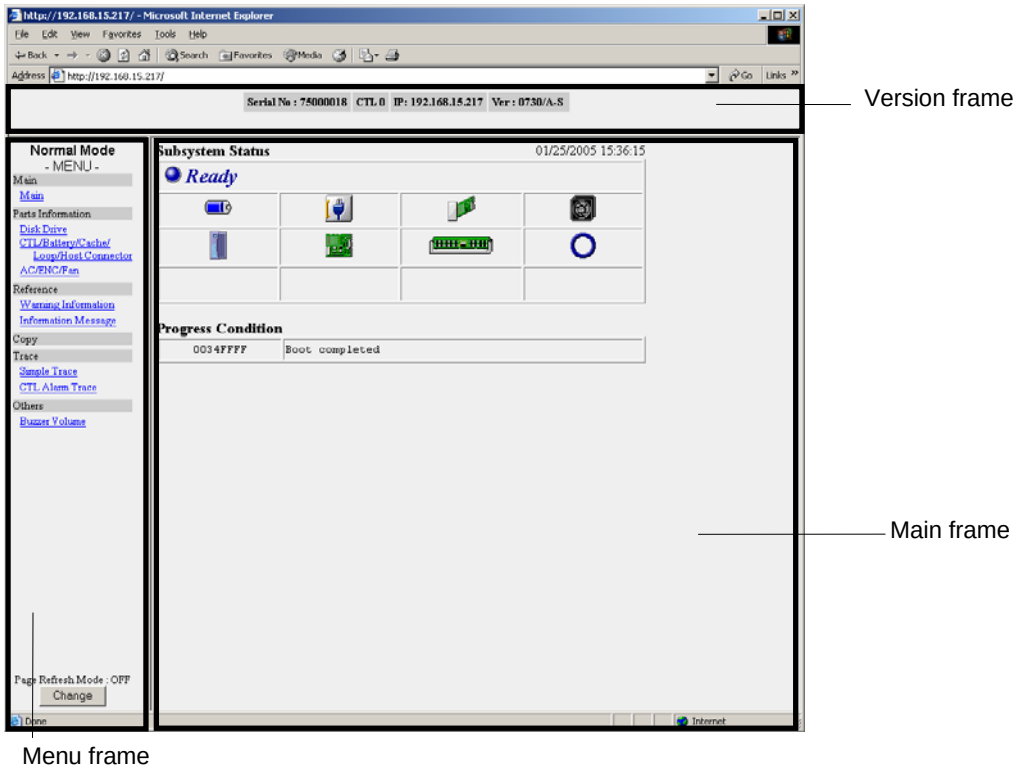


Figure 8.4 Main Screen Outline (iSCSI)

This section includes the following:

- Menu frame
- Main frame
- Version frame

8.3.2.1 Menu Frame

If the Normal Mode is displayed with the menu frame, then clicked, the proper function is executed.

The main frame displays the following information:

- **Main:** The main screen of Normal Mode is displayed.
- **Parts Information:** The status of exchange parts is displayed.

  Disk drive: The status of disk drives is displayed.

  CTL/Battery/Cache/Loop/Host Connector: The status of controllers, cache, loop, and host connector is displayed.

  AC/ENC/Fan: The status of the power supply unit, ENC/SENC unit, and fan assembly is displayed.
- **Reference**

  Warning Information: Fault information that was detected during device information status is displayed.

  Information Message: Fault information, detected during device operation and device information status is displayed.
- **Trace**

  Simple Trace: A window for collecting the Simple trace is displayed.

  CTL Alarm Trace: A window for collecting the CTL Alarm trace is displayed.
- **Others**

  Buzzer Volume: The screen where Buzzer Volume is set up is displayed.
- **Page Refresh Mode:** This button sets up an on/off an automatic redisplay function. When clicked, the on/off mode changes:
  - **OFF** display: This is not refreshed.
  - **ON** display: The screen of the mainframe is refreshed every 5 seconds. The refresh time currently (RTC) is displayed on the right top.

Note: When the PC enters suspension status during operation while the **Page Refresh Mode** is set to **ON**, the Web may not operate correctly after the PC is released from suspension status. When the Web is connected for status monitoring, etc., set the power management of the PC so that the PC does not enter suspension status.

8.3.2.2 Main frame

The main frame displays the following information:

- **Subsystem Status:** The device status and the exchange parts status are displayed.
- **Progress Condition:** The Progress Condition as the device is booting is displayed.

8.3.2.3 Version Frame

The version frame displays the following information:

- **Web title:** The Web title set by a user is displayed. When it is not set, nothing is displayed.
- **Serial No:** The subsystem serial number is displayed.
- **CTL:** The connected controller number is shown.
- **IP:** The connected IP Address of the controller is shown.
- **Rev:** The device version of the microprogram is shown.

8.3.3 Main Screen in Normal Mode

The main screen of normal mode consists of the following:

- Patrol lamp.
- Summary of exchange parts status.
- Progress condition display.
- Page refresh button.

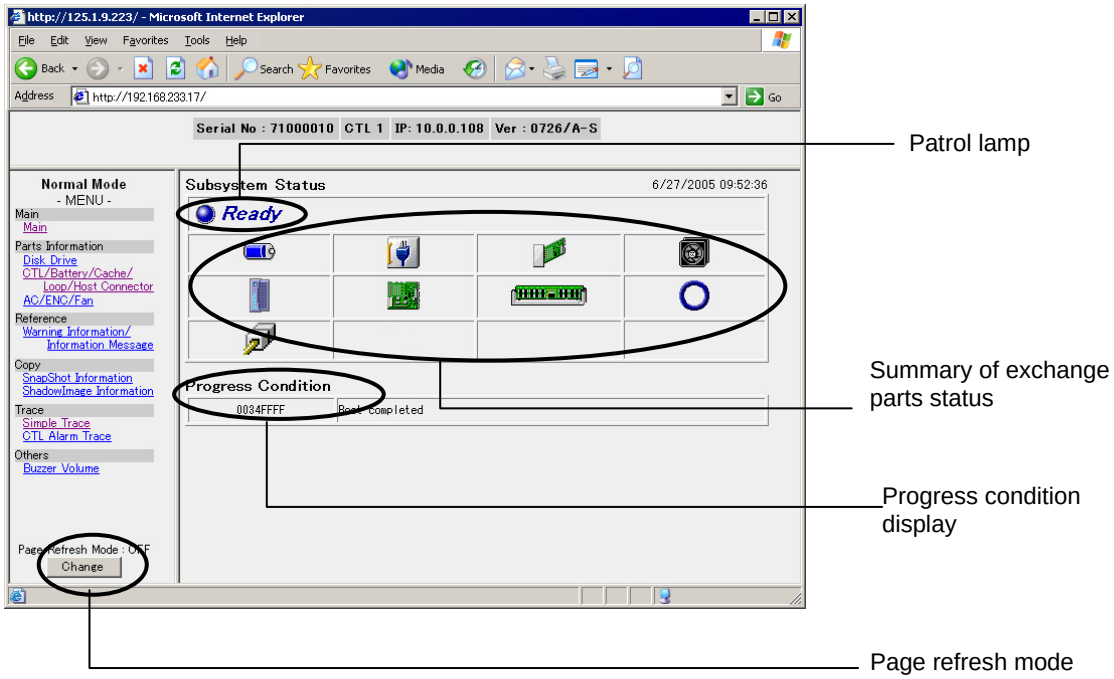


Figure 8.5 Subsystem Condition Display

8.3.3.1 Patrol Lamp

While monitoring the device, the status is displayed.

Table 8.6 Patrol Lamp Display

Image	Status
Booting...	During the start
Ready blue	Normal
Warning yellow	Warning status
Alarm red	Alarm status

8.3.3.2 Summary of Exchange Parts Status

The summary of exchange parts status displays the condition of the exchange parts by changing the color. Detailed information of the specific part is displayed by clicking the part icon.

Table 8.7 Exchange Parts Status Display

Parts		Image		
		Normal	Abnormal	
Power Unit		 blue	 red	
Disk Drive	FC	 blue	 red	
	S-ATA	 blue	 red	
Cache Unit		 green	 red	
Fan Assembly		 black	 red	
Backup Battery Unit		 blue	 red	
Control Unit		 green	 red	
ENC Unit		 green	 red	
SENC Unit		 green	 red	
Fibre Loop on the drive side		 blue	 red	
Host Connector		 gray	 red	Displayed only in the Fibre configuration
NNC		 gray	 red	Displayed only in the NAS configuration

8.3.3.3 Progress Condition Display

The progress condition, as the device is booting, is displayed in the progress condition display box.

8.3.3.4 Page Refresh Button

This button sets the on/off function of the automatic redisplay function. If clicked, the on/off mode changes:

- **OFF** display: The screen is not refreshed.
- **ON** display: The screen of the mainframe is refreshed every 5 seconds. The refresh time currently (RTC) is displayed on the right top.

8.3.4 Status Display of Replaceable Components

The status display screen of replaceable components displays the status of the Disk Drive, Control Unit, Cache Unit, Fiber Channel Loop on the drive side, Fan Assembly, Backup Battery Unit, Power Unit/Power Unit (DC), and ENC Unit that are implemented.

This screen is not displayed if the component is not implemented. When the replaceable component has an abnormal status, a red image is displayed.

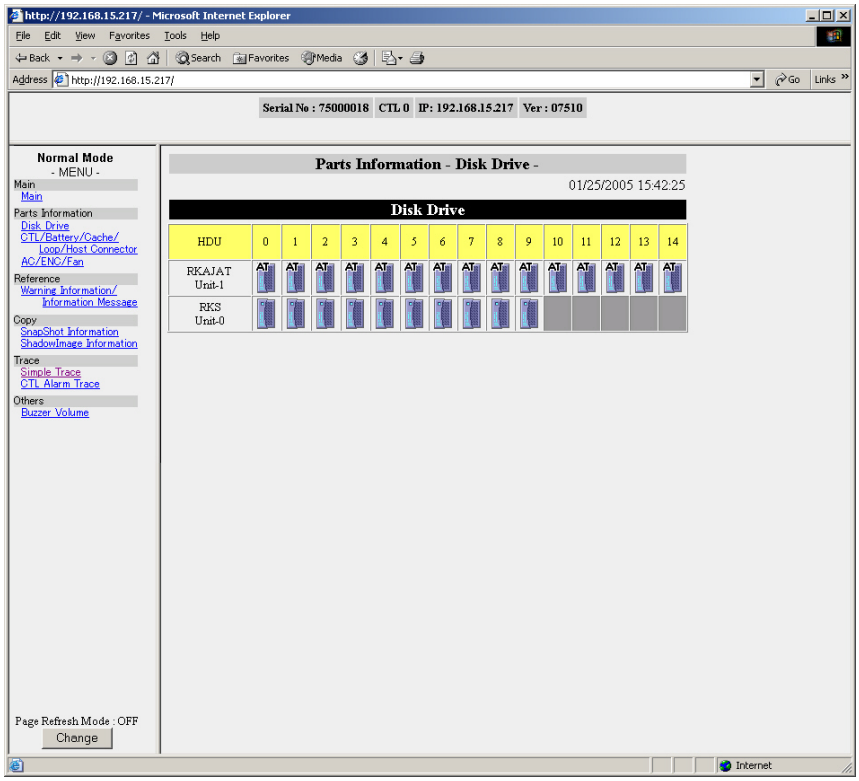


Figure 8.8 Component Status Screen

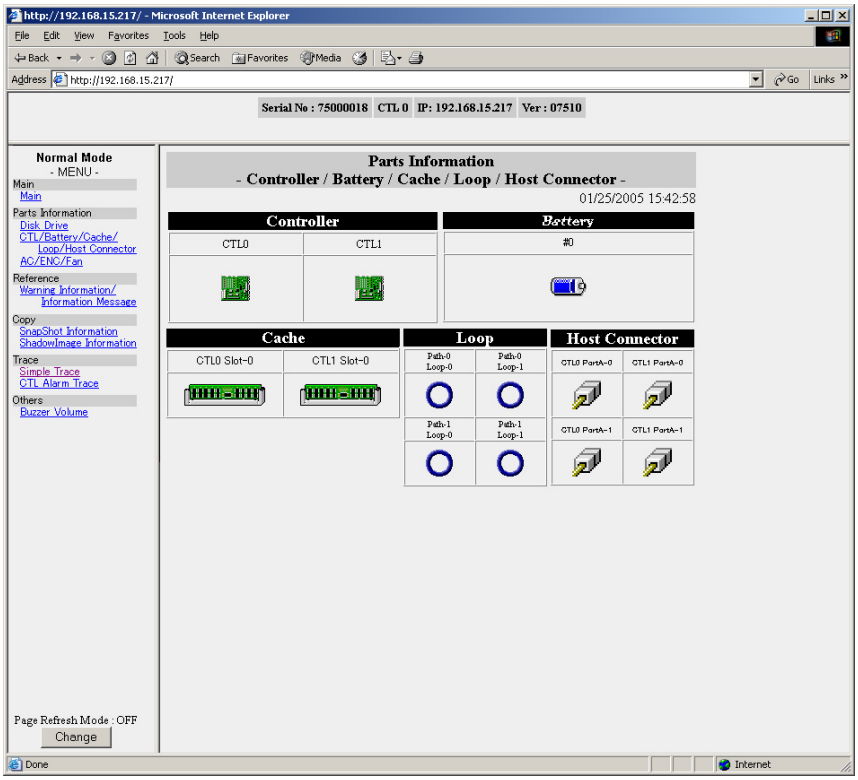


Figure 8.9 Component Status Screen (Controller/Battery/Cache/Loop/Host Computer)

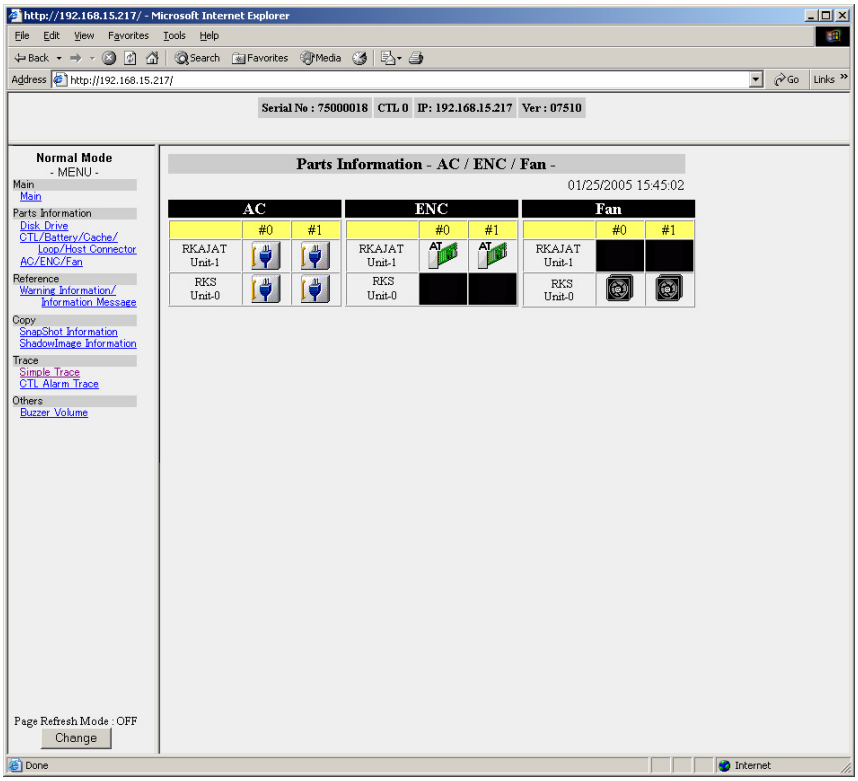


Figure 8.10 Component Status Screen (AC/ENC/FAN)

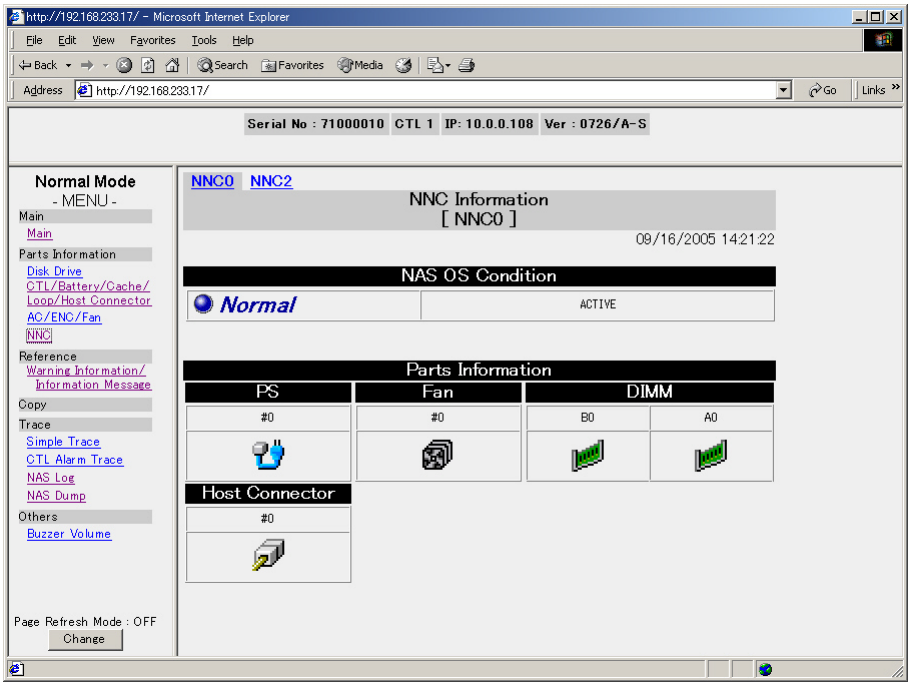


Figure 8.11 NNC Information Screen

Disk Drive (FC):

Image	Status
 blue	Normal.
 red	A fault has occurred to the disk drive.
 red and black	The disk drive port where the fault occurred is not implementing the disk drive.
No display	The disk drive is not implemented (the disk drive where the fault occurred was drawn out).

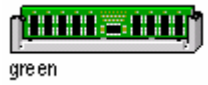
Disk Drive (S-ATA):

Image	Status
 blue	Normal.
 red	Fault has occurred to the disk drive.
 red and black	Disk drive port that the fault occurred is not implementing the disk drive.
No display	Disk drive is not implemented (Except for the status where the disk drive that the fault occurred was drawn out).

Control Unit:

Image	Status
 green	Normal.
 red	Shutdown of the control unit (status where it is not implemented with the setting of the dual system configuration is included). (Control unit may be blocked when an FC interface board failure, a NAS interface board failure, a cache memory failure, a NAS control cable failure or a PCI Express cable failure occur.)
 yellow	Fault of the battery backup circuit.
No display	The fault has not occurred without being implemented with the setting of a single system configuration.

Cache Unit:

Image	Status
 green	Normal.
 red	Fault (status when the unit is not implemented and the extracted fault cache unit is included).

Battery Backup Unit:

Image	Status
 blue	Normal.
 red	There is a fault or the unit is not implemented.

Fan Assembly:

Image	Status
 black	Normal.
 red	There is a fault or the fan assembly is not implemented. (The condition that an AC power supply is not supplied is contained.)

Power Unit/Power Unit:

Image	Status
 blue	Normal.
 red	A fault occurred or the unit is not implemented. (The condition that an AC power supply/DC power supply is not supplied is contained).

ENC Unit:

Image	Status
 green	Normal.
 red	It is fault occurred or not implemented

SENC Unit:

Image	Status
	Normal.
	A fault occurred or the unit is not implemented.

Fibre Channel Loop:

Image	Status
	Normal.
	Fault.

Host Connector:

Image	Status
 gray	Normal.
 red	Fault.

Patrol Lamp:

Monitoring the device, the status is displayed.

Image	Status
 *Ready* blue	Normal
 *Warning* yellow	Warning status
 *Alarm* red	Alarm status

NAS OS Condition:

The NAS OS condition is displayed.

Display	Status
NEW	NAS OS has not been installed.
INST	NAS OS is being installed.
ACTIVE	NAS OS is in operation, and node is in operation.
STOP	NAS OS stops normally.
DOWN	NAS OS stops abnormally.
BOOT	NAS OS is in boot processing.
SHUTDOWN	NAS OS is in stop processsing.
INACTIVE	NAS OS is in operation, and node stops.
DUMP	NAS Dump is being collected.
HUNGUP	Hung-up status.
WARN	NAS Manager has not been installed, or NAS OS is in operation and node status is unknown.
DISUSE	Control unit is blocked because the NAS OS of the appropriate NNC (NAS unit) cannot be used.

NNC PS:

Image	Status
 blue	Normal
 red	Fault

NNC DIMM:

Image	Status
 green	Normal
 red	Fault

NNC FAN:

Image	Status
 black	Normal
 red	Fault

NNC Host Connector:

Image	Status
 white	Normal
 red	Fault

To check the parts status by message, select “Warning Information” from the menu frame in the main screen.

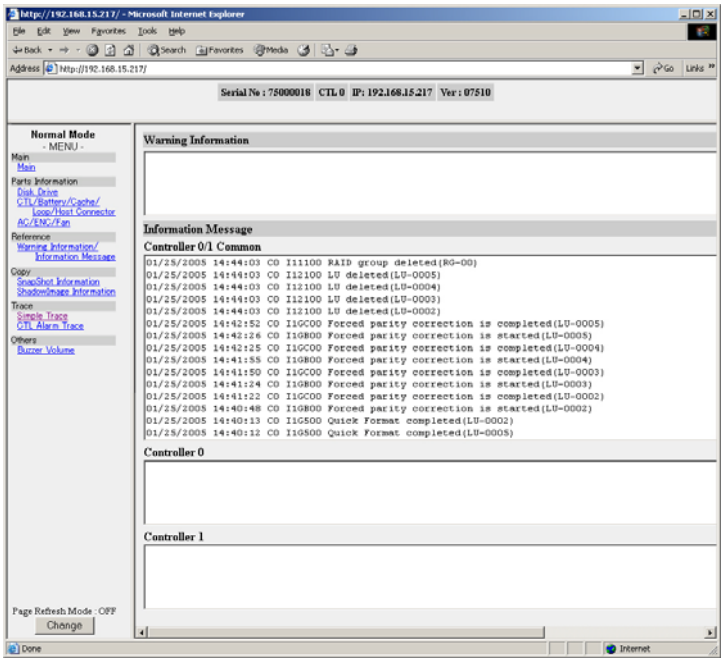

http://192.168.15.217/ - Microsoft Internet Explorer
Serial No : 75000018 CTL 0 IP: 192.168.15.217 Ver : 07510
Normal Mode
- MENU -
Main
Parts Information
Disk Drive
CTL/Battery/Cache/ Loop/Host Connector
AC/ENC/Fan
Reference
Warning Information/ Information Message
Copy
SnapShot Information
ShadowImage Information
Trace
Simple Trace
CTL Alarm Trace
Others
Buzzer Volume
Page Refresh Mode : OFF
Change
Warning Information
Information Message
Controller 0/1 Common
01/25/2005 14:44:03 C0 I1110O RAID group deleted(RG-00)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0005)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0004)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0003)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0002)
01/25/2005 14:42:52 C0 I1GC00 Forced parity correction is completed(LU-0005)
01/25/2005 14:42:26 C0 I1GB00 Forced parity correction is started(LU-0005)
01/25/2005 14:42:25 C0 I1GC00 Forced parity correction is completed(LU-0004)
01/25/2005 14:41:55 C0 I1GB00 Forced parity correction is started(LU-0004)
01/25/2005 14:41:50 C0 I1GC00 Forced parity correction is completed(LU-0003)
01/25/2005 14:41:24 C0 I1GB00 Forced parity correction is started(LU-0003)
01/25/2005 14:41:22 C0 I1GC00 Forced parity correction is completed(LU-0002)
01/25/2005 14:40:48 C0 I1GB00 Forced parity correction is started(LU-0002)
01/25/2005 14:40:13 C0 I1GS00 Quick Format completed(LU-0002)
01/25/2005 14:40:12 C0 I1GS00 Quick Format completed(LU-0005)
Controller 0
Controller 1
Done
Internet

Figure 8.12 Warning Information Screen

8.3.5 Information Message

Fault information and status information of the device that detected it during the device operation are displayed.

Fault information and status information after the device completes a boot are displayed in the **Controller 0/1 Common** box.

Fault information and status information as the device is booting are displayed in the box of **Controller 0** and **Controller 1**.

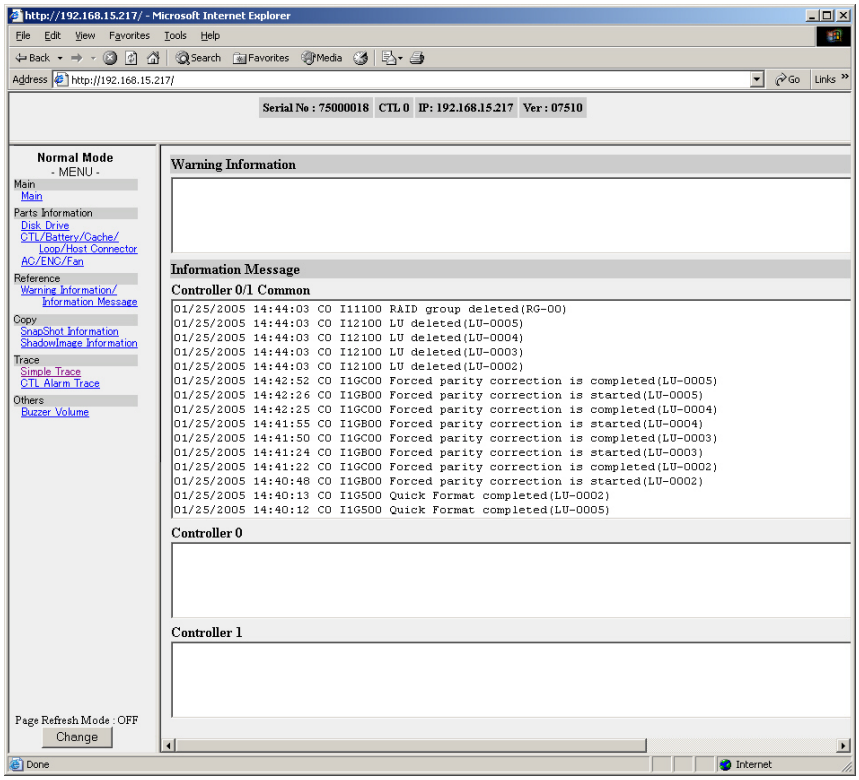

http://192.168.15.217/ - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://192.168.15.217/
Serial No : 75000018 CTL 0 IP: 192.168.15.217 Ver : 07510
Normal Mode
- MENU -
Main
Main
Parts Information
Disk Drive
CTL/Battery/Cache/ Loop/Host Connector
AC/ENC/Fan
Reference
Warning Information/ Information Message
Copy
SnapShot Information
ShadowImage Information
Trace
Simple Trace
CTL Alarm Trace
Others
Buzzer Volume
Page Refresh Mode : OFF
Change
Warning Information
Information Message
Controller 0/1 Common
01/25/2005 14:44:03 C0 I11100 RAID group deleted(RG-00)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0005)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0004)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0003)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0002)
01/25/2005 14:42:52 C0 I1GC00 Forced parity correction is completed(LU-0005)
01/25/2005 14:42:26 C0 I1GB00 Forced parity correction is started(LU-0005)
01/25/2005 14:42:25 C0 I1GC00 Forced parity correction is completed(LU-0004)
01/25/2005 14:41:55 C0 I1GB00 Forced parity correction is started(LU-0004)
01/25/2005 14:41:50 C0 I1GC00 Forced parity correction is completed(LU-0003)
01/25/2005 14:41:24 C0 I1GB00 Forced parity correction is started(LU-0003)
01/25/2005 14:41:22 C0 I1GC00 Forced parity correction is completed(LU-0002)
01/25/2005 14:40:48 C0 I1GB00 Forced parity correction is started(LU-0002)
01/25/2005 14:40:13 C0 I1G500 Quick Format completed(LU-0002)
01/25/2005 14:40:12 C0 I1G500 Quick Format completed(LU-0005)
Controller 0
Controller 1
Done
Internet

Figure 8.13 Information Message Screen

8.3.6 Setting the Buzzer Sound Volume

Note: Set the buzzer volume for the environment in which I/Os from a host are not issued while the system is maintained or before the host is started up.

The buzzer volume can be adjusted for 5 stages. Click the **Buzzer Volume** of the menu frame to enter into the buzzer volume-setting screen. If the buzzer volume is designated with the radio button and the **OK** button is clicked, the buzzer volume is changed.

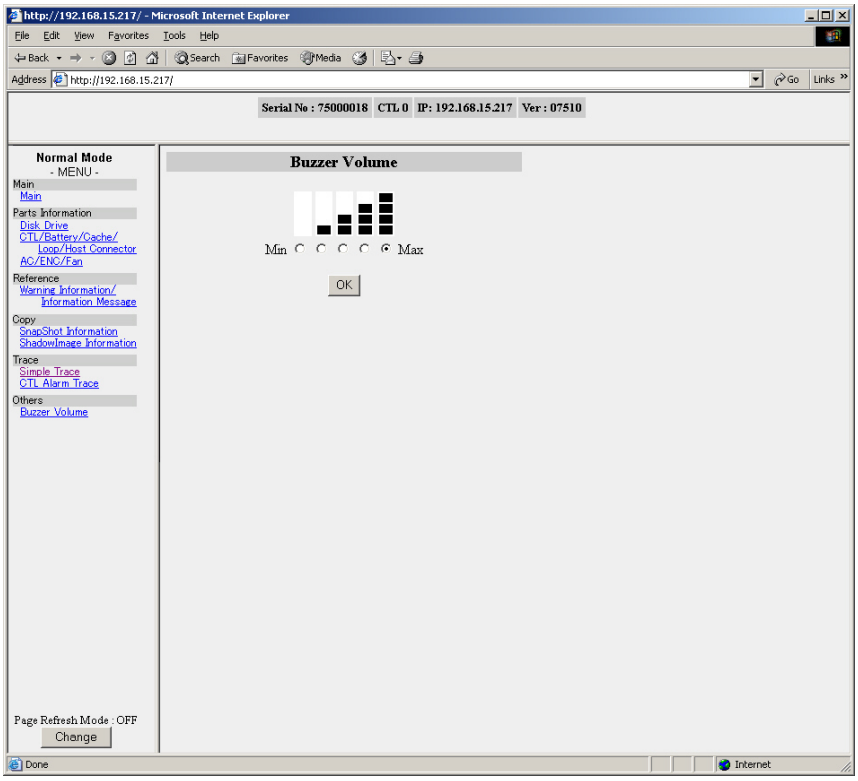


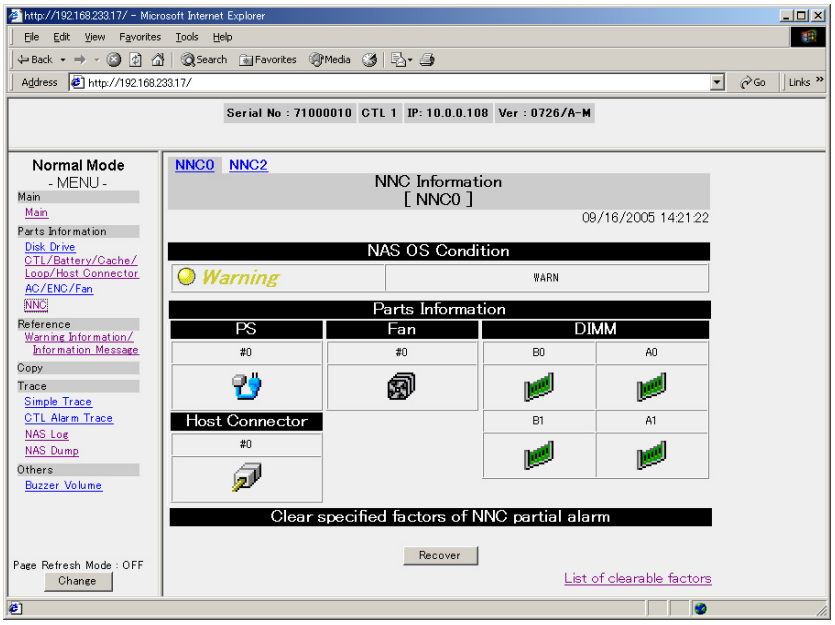
Figure 8.14 Buzzer Volume Screen

8.3.7 Clear Specified Factors of NNC Partial Alarm

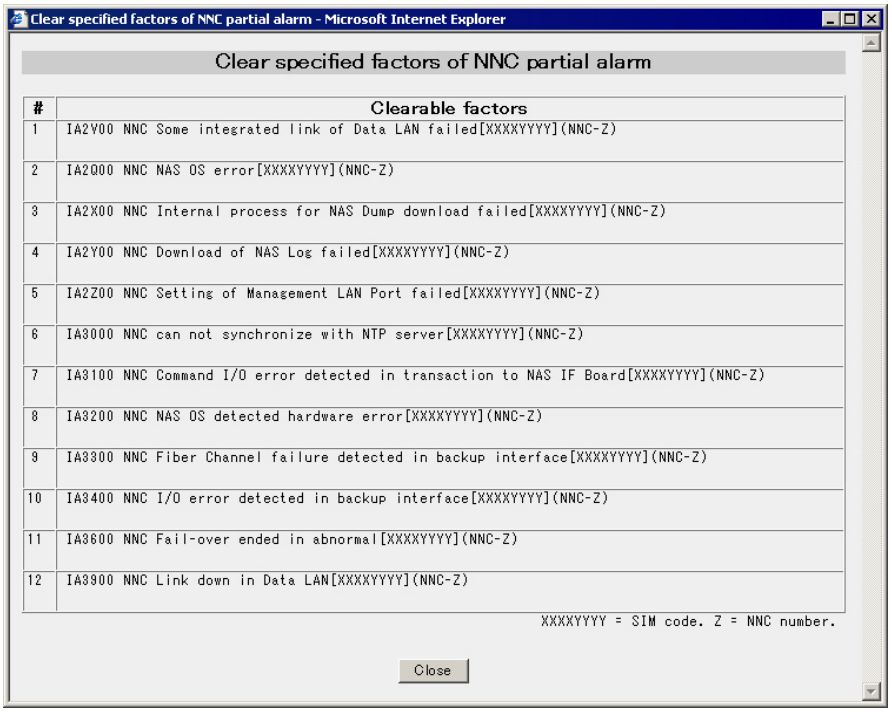
The Warning status of the control unit may not be released when the WARNING LEDs on the array subsystem and the NAS unit are lighting up even though the recovery works for some specific NNC partial alarms.

Release the Warning status of the control unit and turn off each WARNING LED according to the following procedures. The “Clear specified factors of NNC partial alarm” can be executed only to the NNC (NAS unit) connected to the control unit.

1. Before operating “Clear specified factors of NNC partial alarm”.
2. Click the List of clearable factors.

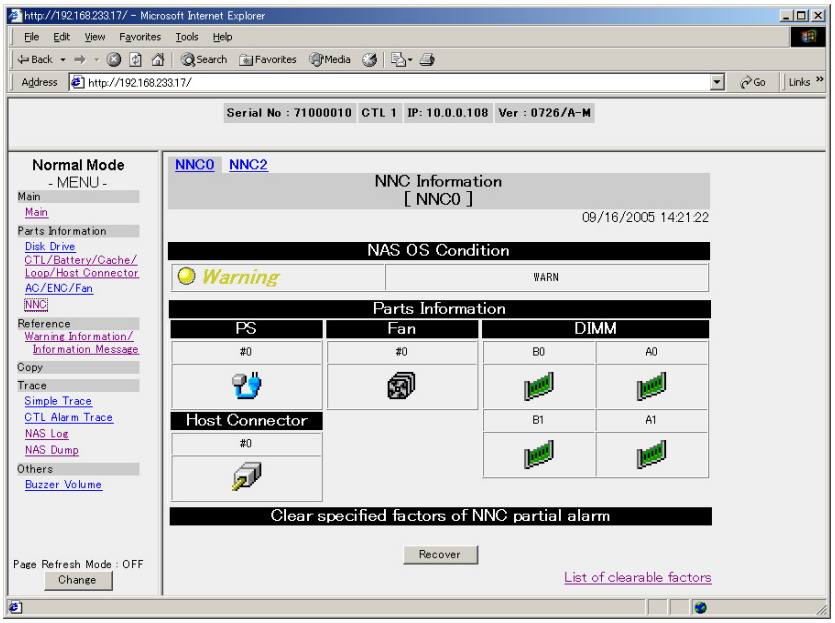


3. Verify that either of the lists where the failure factors are displayed.

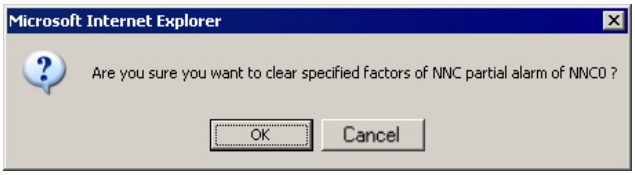

Clear specified factors of NNC partial alarm - Microsoft Internet Explorer
Clear specified factors of NNC partial alarm
Clearable factors
1 IA2Y00 NNC Some integrated link of Data LAN failed[XXXXYYYY](NNC-Z)
2 IA2Q00 NNC NAS OS error[XXXXYYYY](NNC-Z)
3 IA2X00 NNC Internal process for NAS Dump download failed[XXXXYYYY](NNC-Z)
4 IA2Y00 NNC Download of NAS Log failed[XXXXYYYY](NNC-Z)
5 IA2Z00 NNC Setting of Management LAN Port failed[XXXXYYYY](NNC-Z)
6 IA3000 NNC can not synchronize with NTP server[XXXXYYYY](NNC-Z)
7 IA3100 NNC Command I/O error detected in transaction to NAS IF Board[XXXXYYYY](NNC-Z)
8 IA3200 NNC NAS OS detected hardware error[XXXXYYYY](NNC-Z)
9 IA3300 NNC Fiber Channel failure detected in backup interface[XXXXYYYY](NNC-Z)
10 IA3400 NNC I/O error detected in backup interface[XXXXYYYY](NNC-Z)
11 IA3600 NNC Fail-over ended in abnormal[XXXXYYYY](NNC-Z)
12 IA3900 NNC Link down in Data LAN[XXXXYYYY](NNC-Z)
XXXXYYYY = SIM code. Z = NNC number.
Close

4. Clear specified factors of NNC partial alarm.

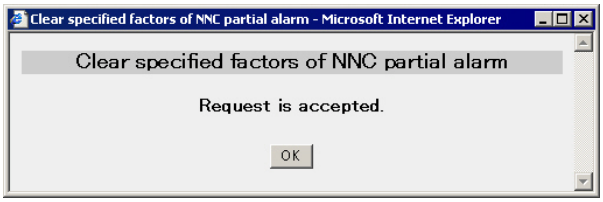
5. Click the Recovery button.



6. A message appears, asking you to verify the setting is displayed. Click the OK button.

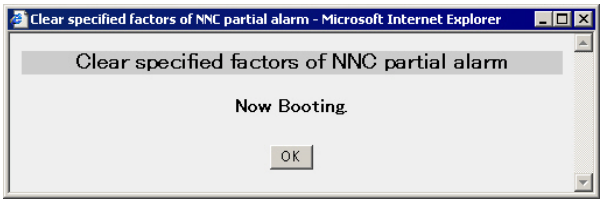


7. Check the NNC partial alarm recovery. When the "Clear specified factors of NNC partial alarm" is completed normally.


Clear specified factors of NNC partial alarm - Microsoft Internet Explorer
Clear specified factors of NNC partial alarm
Request is accepted.
OK

8. Click the OK button.
9. Click Warning Information on the menu window, and check that the indication of the partial alarm is turned off.

   If the array subsystem was booting at the time of clicking the Recovery button:


Clear specified factors of NNC partial alarm - Microsoft Internet Explorer
Clear specified factors of NNC partial alarm
Now Booting.
OK

10. Click the OK button. Execute this again after the array subsystem is in the READY status.

8.4 Troubleshooting Using a Web Connection

This section includes the following:

- Checking subsystem status
- Checking the progress condition display
- Checking component status
- Checking log messages
- Troubleshooting by using messages
- Reading failure information

8.4.1 Checking Subsystem Status

Check the position of the failed part of the unit on the main window in the normal mode of the Web.

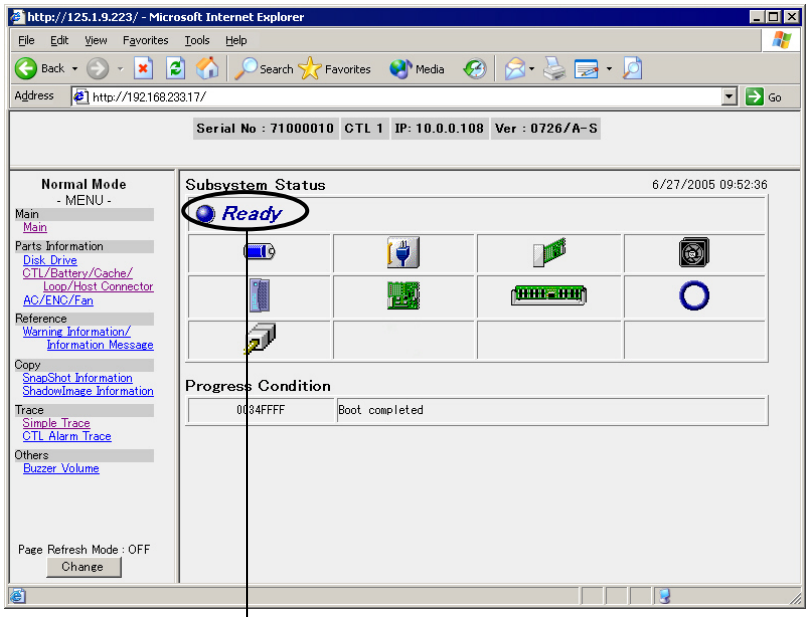


Figure 8.15 Subsystem Status Screen

Subsystem Status:

Booting	Ready	Warning	Alarm
Booting... black	Ready blue	Warning yellow	Alarm red

8.4.2 Checking the Progress Condition Display

If **Booting...** is indicated in the window (the controller is being started up), the progress of the start-up operation can be confirmed according to the following procedure:

1. Turn on the page refresh mode (click the **ON** button).

   The window is updated automatically at 5-second intervals. (If the **OFF** button of the page refresh mode is activated, this operation is not necessary.)

   If the page refresh mode is not activated in the main window, press the update button of the browser to update the window.

2. Observe the condition-in-progress within the window.

   If the start-up operation is completed, **Boot completed** is indicated in this part.

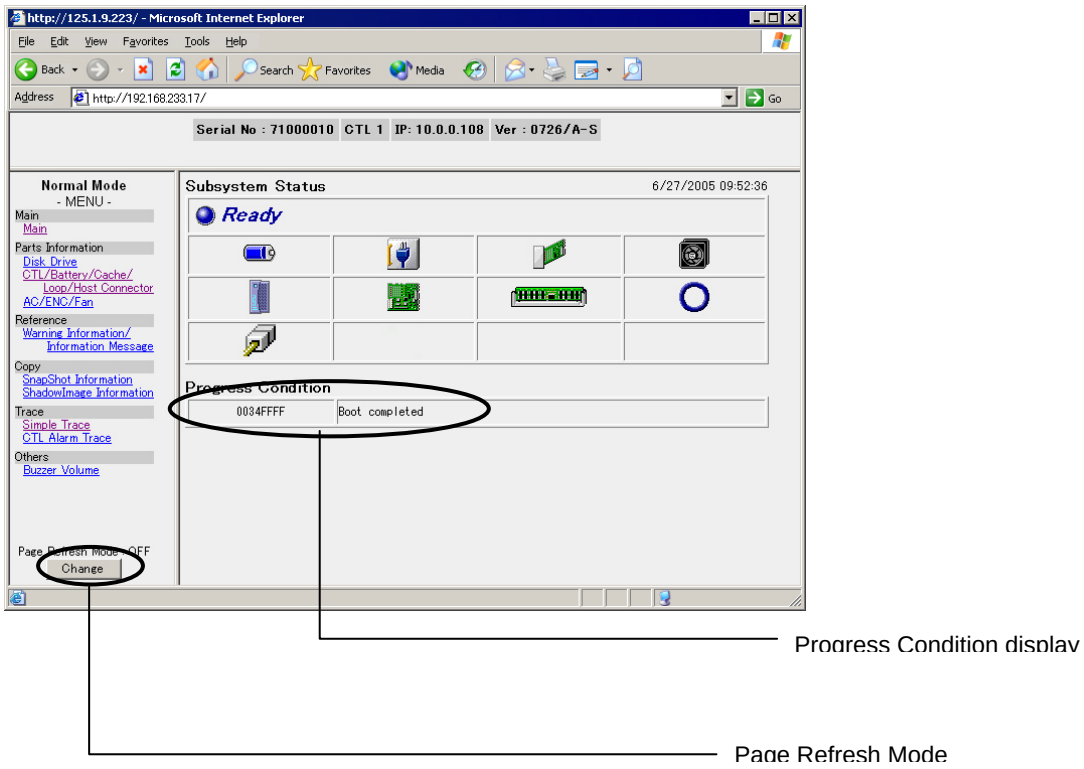


Figure 8.16 Progress Condition Display

8.4.3 Checking Component Status

Click each part of Replace Part Summary in the main window; the following window displays and the state of the part is displayed.

In this example, the selected (clicked) part is at the head of the window. You can also select this window by clicking the Parts Information menu in the main window. In this window, you can confirm the state of each part in detail. If a part fails, its corresponding icon turns red.

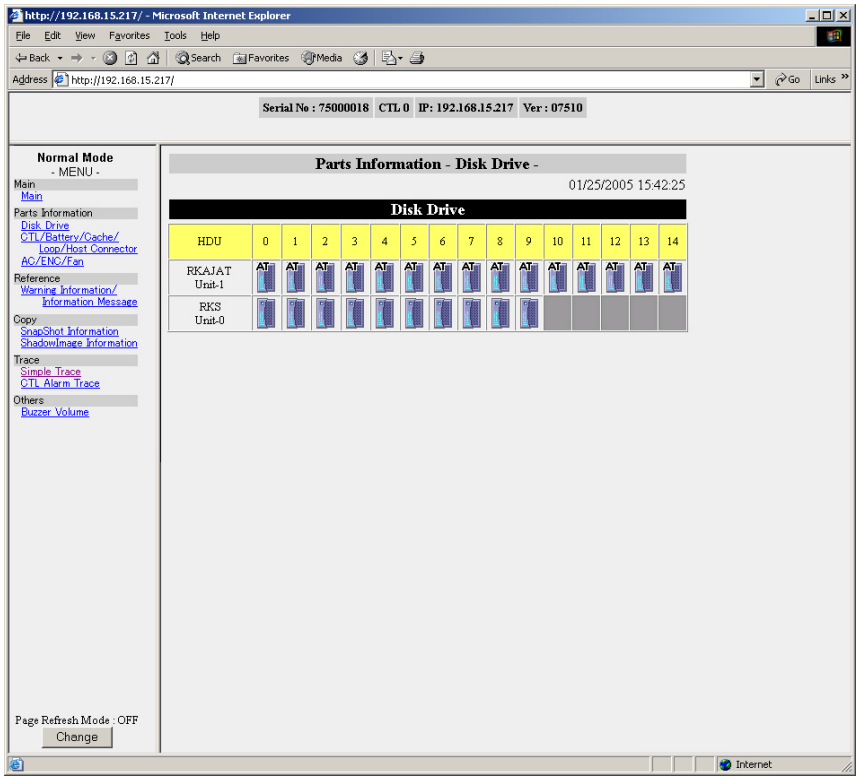


Figure 8.17 Replace Part Summary Screen (HDD)

The following screen is displayed only when used in the NAS unit.

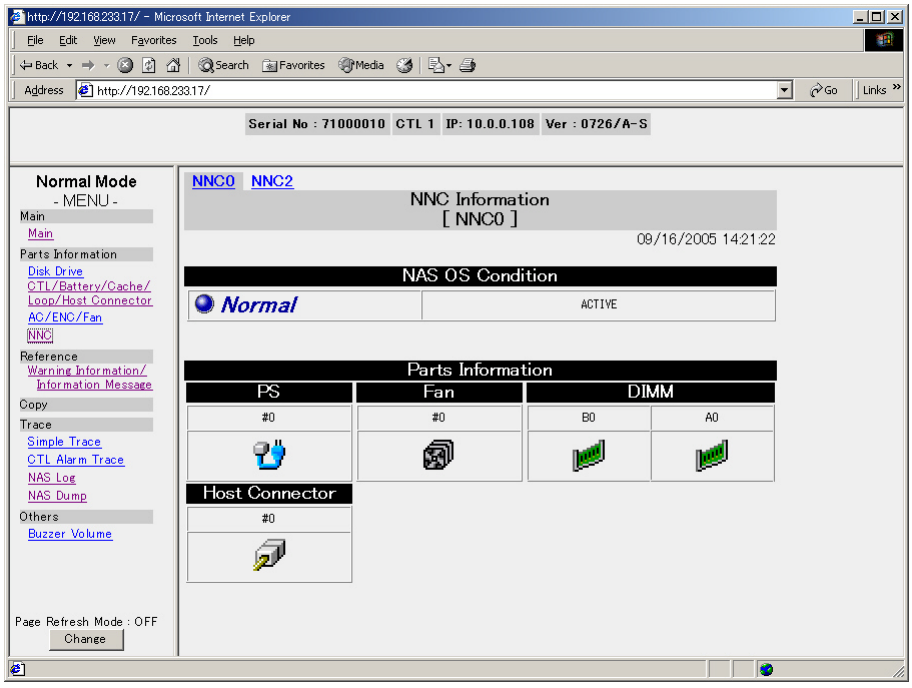


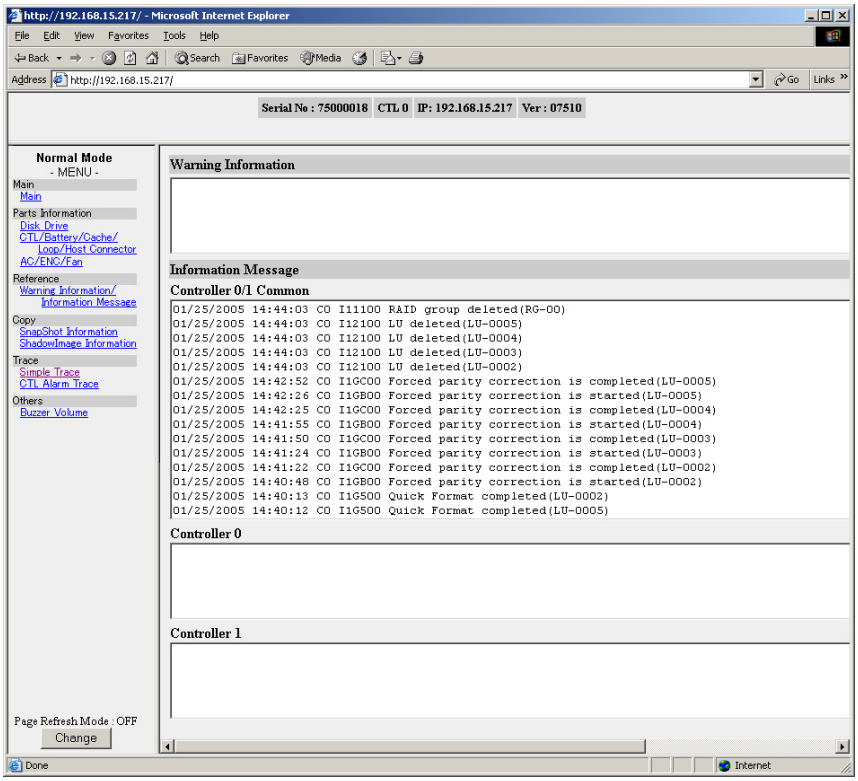
Figure 8.18 NNC Information Screen

8.4.4 Checking Log Messages

To check log messages:

1. Click the **Information Message** menu in the main window.

   The Information Message window displays:


http://192.168.15.217/ - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://192.168.15.217/
Serial No : 75000018 CTL 0 IP: 192.168.15.217 Ver : 07510
Normal Mode
- MENU -
Main
Main
Parts Information
Disk Drive
CTL/Battery/Cache/ Loop/Host Connector AC/ENC/Fan
Reference
Warning Information/ Information Message
Copy
SnapShot Information
ShadowImage Information
Trace
Simple Trace
CTL Alarm Trace
Others
Buzzer Volume
Page Refresh Mode : OFF
Change
Warning Information
Information Message
Controller 0/1 Common
01/25/2005 14:44:03 C0 I11100 RAID group deleted(RG-00)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0005)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0004)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0003)
01/25/2005 14:44:03 C0 I12100 LU deleted(LU-0002)
01/25/2005 14:42:52 C0 I1GC00 Forced parity correction is completed(LU-0005)
01/25/2005 14:42:26 C0 I1GB00 Forced parity correction is started(LU-0005)
01/25/2005 14:42:25 C0 I1GC00 Forced parity correction is completed(LU-0004)
01/25/2005 14:41:55 C0 I1GB00 Forced parity correction is started(LU-0004)
01/25/2005 14:41:50 C0 I1GC00 Forced parity correction is completed(LU-0003)
01/25/2005 14:41:24 C0 I1GB00 Forced parity correction is started(LU-0003)
01/25/2005 14:41:22 C0 I1GC00 Forced parity correction is completed(LU-0002)
01/25/2005 14:40:48 C0 I1GB00 Forced parity correction is started(LU-0002)
01/25/2005 14:40:13 C0 I1G500 Quick Format completed(LU-0002)
01/25/2005 14:40:12 C0 I1G500 Quick Format completed(LU-0005)
Controller 0
Controller 1
Done
Internet

2. In the Information Message window, identify the cause of the failure and confirm the recovery measures.

   Information about detected failures and the state of the unit display in the above window.

   Information about failures and the state at the start-up time of the unit displays for each Controller in the **Controller 0** and **Controller 1** boxes.

The contents of each message are shown in the following examples:

- CUDG (Self-test at power-on) Detection Message.

The CUDG detection message is displayed in the Controller 0 or Controller 1 box as shown in the following example:

Example:

```
Controller x
MM/DD/YYYY HH:MM:SS Cx C0    ◆◆◆◆◆◆◆◆ ◆◆◆◆◆◆◆◆ ◆◆◆◆◆◆◆◆ ◆◆◆◆◆◆◆◆
MM/DD/YYYY HH:MM:SS Cx B0    ◆◆◆◆◆◆◆◆ ◆◆◆◆◆◆◆◆ ◆◆◆◆◆◆◆◆ ◆◆◆◆◆◆◆◆
MM/DD/YYYY HH:MM:SS Cx A0    △△△△△△△△△ △△△△△△△△△ △△△△△△△△△ △△△△△△△△△
MM/DD/YYYY HH:MM:SS Cx 90    △△△△△△△△△ △△△△△△△△△ △△△△△△△△△ △△△△△△△△△
MM/DD/YYYY HH:MM:SS Cx 80    △△△△△△△△△ △△△△△△△△△ △△△△△△△△△ △△△△△△△△△
MM/DD/YYYY HH:MM:SS Cx 70    △△△△△△△△△ △△△△△△△△△ △△△△△△△△△ △△△△△△△△△
MM/DD/YYYY HH:MM:SS Cx 60    □□□□□□□□ Y Y M M D D ── H H M M S S ── ──────────
MM/DD/YYYY HH:MM:SS Cx ○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○○
MM/DD/YYYY HH:MM:SS Cx CTLx
```

MM/DD/YYYY: Date of occurrence
HH:MM:SS: Time of occurrence
Cx: # of Controller in which failure is detected
◆◆◆◆◆◆◆◆: PCI Config information
△△△△△△△△: Detailed information
□□□□□□□□: Message code
○○○○○○○○○○○○: Message text (Any number of letters)
Y Y M M D D : Date of occurrence
H H M M S S : Time of occurrence
———— : Reservation area
CTLx: CUDG executing controller #

- Flash/RAM Micro Detection Message.

The Flash/RAM micro detection message is displayed in the **Controller 0/1 Common**, **Controller 0**, or **Controller 1** box, as shown in the following example. The latest one is shown on the top line.

Note: The date and time the RTC is set in the detection controller is displayed in this message. If the RTC is different from one control to another, the displayed time of occurrence may differ within messages (the message on the upper line is issued prior to the message on the lower line).

In this example, the latest message is also indicated at the top.

Example:

```
MM/DD/YYYY HH:MM:SS Cx ●●●●●● ○○○○○○○○○○○  : ■■■■■■/◆◆◆◆
MM/DD/YYYY HH:MM:SS Cx ●●●●●● ○○○○○○○○○○○  : ■■■■■■/◆◆◆◆
                                          :
```

MM/DD/YYYY: Confirmed data
HH:MM:SS: Confirmed times
Cx: Error detected Controller #
●●●●●●: Message code (**Rxxxxx**: flash-detected messages, **Ixxxxx**: progress messages, **Wxxxxx**: warning messages, **Hxxxxx**: failure messages)
○○○○○○○○○○○ Message text (any number of letters)
■■■■■■: Recovery measures code
◆◆◆: Collecting failure information code

8.4.5 Troubleshooting Using Messages

The contents of each failure detected during operation are reported by a message. The failures detected during operation and the state of the unit, after the main switch of this unit is turned on, are reported.

The five types of message codes are displayed in the following table:

Table 8.4 Message Code Types

Message code	Measures
018xxxxx	Errors detected by CUDG.
Rxxxxx	Flash detected messages.
Ixxxxx	Progress messages.
Wxxxxx	Warning messages.
Hxxxxx	Failure messages.

8.4.5.1 Errors Detected by CUDG

When the Errors detected by CUDG are displayed, call your Customer Engineer.

8.4.5.2 Flash Detected Messages

When the following Flash detected messages are displayed, follow the instructions to resolve the problem.

Table 8.5 Flash Detected Messages

Message Code	Message Text	Recovery Measures
RA00xx	Microprogram error [FLS]	Restarting the equipment.
RA7000	Microprogram revision mismatch	
RB0000	Upload system error	Check the microprogram you want to install and install it over again.
RB0600	No micro program	Perform the new installation upgrade.
RB0A00	Upload file SUM check error	A sum check error occurred in a read file during an upload. Check the microprogram you want to install and install it over again.
RB0E00	Up grade check NG	The upgrade check of the microprogram failed. (An upgrade version of a microprogram does not conform to the microprogram being upgraded.) Do a new install of the microprogram.
RB3000	File size error	Check the microprogram you wish to install.
RB3100	File open error	
RB3200	File read error	
RB3500	Bad block ID	
RB3600	Bad LBA in START 600 DAT	
RB7000	Program size too large	
RB8000	Old microprogram exists	If the installation can be continued, the RAID group and LU deformation are initialized. (In this case, all the data in the disk drive are deleted. When the data in the disk drive need to be saved, stop the work and perform the update installation.
RB8300	Empty system retry full install	The update installation cannot be executed because a system does not exist in the disk drive. Execute a new installation.
RBA000	Down grade check NG	The present microprogram version cannot be updated to a specified microprogram version. Check the work procedure. Execute a new installation.

When a Flash detected message other than those shown above is displayed, inform your Customer Engineer of the message code.

8.4.5.3 Progress Messages

When the following Progress messages are displayed, follow the instructions to resolve the problem.

Table 8.6 Progress Messages (continues on next page)

Message Code	Message Text	Recovery Measures
I031xy	Path recovered automatically	The path recovered automatically. (x: Remote DF# (0), y: Path # (0 or 1))
I10000	Subsystem is ready	The unit is ready.
I11000	All raid group initialized	All RAID groups were deleted.
I111xx	RAID group deleted (RG-xx)	All LUs were deleted. (xx: RAID group# (0-14))
I12000	ALL LU initialized	All LUs were deleted. (This is also displayed when the LU#0 is created.)
I12100	LU deleted (LU-xxx)	LUs were deleted. (xxx: LU# (0-511))
I12200	LU format completed (LU-xxx)	LU formatting was completed. (xxx: LU# (0-511))
I12400	LU format start (LU-xxx)	An LU formatting was started. (xxx: LU# (0-511))
I12500	Unified LUs separated (Uni: LU-xxx)	Dissolution of all LU unification (to dissolve unification of all the unified LUs and to split them into internal LUs) was executed. (xxx: LU# (0 to 511) of a unified LU to be split)
I12600	Last LU separated from unified LU (Uni: LU-xxx)	A separation of a final LU of a unified LU (to separate the last one of the internal LUs which have been combined with a unified LU) was executed. (xxx: LU# (0 to 511) of a unified LU to be split)
I12700	LU reappeared (Uni: LU-xxx)	An internal LU(s) was validated again through splitting of all unified LUs or a separation of a final LU. (xxx: An LU# (0 to 511) of an internal LU which has been separated and validated)
I15Axy	Dynamic sparing start (Unit-x, HDU-y) [zzzzzzzzzz]	Dynamic sparing started. (x: Unit ID# (0-14), y: Disk drive# (RKS=0-13, RKAJ=0-14), z: Detailed code)
I17002	Default LU-CTL change failed [PS OFF]	Set the equipment in the ready state and turn off the power, then turn on the power again
I17003	Default LU-CTL change failed [HOT]	Use the system as it is
I17004	Default LU-CTL change failed [LU] Permanent LU	
I1A00x	Permanent LU disable (Default CTL-x)	Set the equipment in the ready state and turn off the power, then turn on the power again.
I1A10x	Permanent LU deleted (Default CTL-x)	LU residence is deleted. (When RAID group/LU is deleted) (x: Default Controller# (0 or 1)
I1A30x	Permanent LU enable (Default CTL-x)	The FlashAccess function was turned on. (x: Default Controller# (0 or 1))

Table 8.6 Progress Messages (continued)

Message Code	Message Text	Recovery Measures
I1B100	Forced parity correction completed	Forced parity recovery processing was finished.
I1C0xy	Loop diagnostic start (Path-x, Loop-y)	Loop diagnosis was started. (x: Path# (0 or 1), y: Loop# (0 or 1))
I1C1xy	Loop diagnostic end (Path-x, Loop-y)	Loop diagnosis was finished. (x: Path# (0 or 1), y: Loop# (0 or 1))
I1E000	Online verify completed [odd unit]`	Check of the frames with even numbers was completed in the online verification.
I1E100	Online verify completed [even unit]	Check of the frames with odd numbers was completed in the online verification.
I61D00	Shutdown warning	Turn off power supply by main switch.
IA100x	NNC power on (NNC-x)	NCC power supply was turned on. x: NNC # （0-3）
IA110x	NNC boot started (NNC-x)	NNC boot was started. x: NNC # （0-3）
IA120x	NNC is ready (NNC-x)	NNC is ready. x：NNC # （0-3）
IA130x	NNC shutdown started (NNC-x)	NNC shutdown was started. x：NNC # （0-3）
IA140x	NNC shutdown completed (NNC-x)	NNC shutdown was completed. x：NNC # （0-3）
IA150x	NNC power off (NNC-x)	NNC power supply was turned off. x：NNC # （0-3）
IA1P0x	NNC NAS OS installation completed (CTL-x, NNC-y)	NAS OS installation on the NNC. was completed x：Controller # （0-1） y：NNC # （0-3）
IA1Q0x	NNC NAS OS installation started (CTL-x, NNC-y)	NAS OS installation on the NNC was started. x：Controller # （0-1） y：NNC # （0-3）
IA1T0x	NNC NAS dump process started (NNC-x)	NNC Dump collection was started. x：NNC # （0-3）
IA1U0x	NNC recovered from partial alarm (NNC-x)	NNC was recovered from a partial error. x：NNC # （0-3）
IA1V0x	NNC recovered (NNC-x)	NNC was recovered from an error. x：NNC # （0-3）
IA2R00	NNC PCI Express link recovered [x] (NNC-y)	The link of the NNC PCI Express was recovered. x：Failed part code y：NNC # （0-3）

Table 8.6 Progress Messages (continued)

Message Code	Message Text	Recovery Measures
IA2V00 (Note1)	NNC Some integrated link of Data LAN failed [xy] (NNC-z)	Identify failed part by checking the LED beside the data LAN port. Confirm if the LAN cable is firmly connected to the LAN port and if there is no failure in network switch. If there are some failures, get rid of them.
IA3000 (Note1)	NNC can not synchronize with NTP server [xy] (NNC-z)	Check the NTP server settings and network configuration, and then change them if necessary.
IA3300 (Note1)	NNC Fibre Channel failure detected in backup interface [xy] (NNC-z)	Check if the backup device is firmly connected to the NNC (NAS Unit) displayed in this message. If the backup device is not connected firmly, reconnect it firmly.
IA3400 (Note1)	NNC I/O error detected in backup interface [xy] (NNC-z)	
IA3900 (Note1)	NNC Link down in Data LAN [xy] (NNC-z)	Identify failed part by checking the LED beside the data LAN port. Confirm if the LAN cable is firmly connected to the LAN port and if there is no failure in network switch. If there are some failures, get rid of them.

Note1: After getting rid of the failure, execute it according to section 8.3.7.

Note2: When a Progress message other than those shown above is displayed, inform your Customer Engineer of the message code.

8.4.5.4 Warning Messages

When the following Warning messages are displayed, follow the instructions to resolve the problem.

Table 8.7 Warning Messages

Message Code	Message Text	Recovery Measures
W03200	Battery SW off	Turn on the battery unit switch.

When a Warning messages other than those shown above is displayed, inform your Customer Engineer of the message code.

8.4.5.5 Failure Messages

When the following Failure messages are displayed, follow the instructions and resolve the problem.

Table 8.8 Failure Messages

Message Code	Message Text	Recovery Measures
HI0201	PS OFF failed [POFNONCLD]	Turn on PS, then off again.
HI0202	PS OFF failed [POFNOJOB]	

When a Warning message other than those shown above is displayed, inform your Customer Engineer of the message code.

8.4.6 Reading Failure Information

- The history of the unit, after it is turned on, is displayed in the **Information Message**.
- The **Subsystem is Ready** message displays the time when the unit is ready. Messages sent after the power is turned on until the unit is ready are displayed prior to this message. Messages sent after the unit is ready are displayed after this message.
- Carefully observe the following: **Wxxxxx** (Warning message), **Hxxxxx** (Failure message), and **Rxxxxx** (Flash detection message).
- The following messages are displayed when failures occur and when they are solved. If the recovery message is displayed after a failure occurrence message, the failure has been solved.

Table 8.9 How to Read Failure Information (continues to the next page)

No.	Description	Failure detected messages		Failure recovery messages	
1	Controller error/recovery	W00100	CTL alarm (CTL-x)	I0010x	CTL recovered (CTL-x)
2	Cache memory error/ recovery	W0D0xy	CACHE alarm (CTL-x, CACHE-y)	I0020x	CACHE recovered (CACHE-x)
3	Battery error/recovery	W0300x	Battery alarm	I00300	Battery recovered
		W0310x	Battery removed	I0030x	Battery recovered (Battery-x)
		W0320x	Battery SW off		
		W0330x	Battery Thermal alarm		
4	Battery backup circuit error/ recovery	W0340x	Battery backup circuit alarm (CTL-x)	I0040x	Battery backup circuit recovered (CTL-x)
5	Fan error/recovery	W040xy	FAN alarm (Unit-x, FAN-y)	I005xy	FAN recovered (Unit-xx, FAN-y)
		W04100	FAN alarm (CTL-Unit, FAN-x)	I00500	FAN recovered (CTL-Unit, FAN-x)
6	Power supply error/ recovery	W050xy	PS alarm (Unit-x, PS-y)	I006xy	PS recovered (Unit-x, PS-y)
		W0G400	PS alarm [RKA] (Unit-x, PS-y)		
		W0G500	PS alarm [RKAAT] (Unit-x, PS-y)		
		W0G600	PS alarm [RKAJ] (Unit-x, PS-y)		
		W0G700	PS alarm [RKAJAT] (Unit-x, PS-y)		
		W05100	PS alarm (CTL-Unit, PS-x)	I00600	PS recovered (CTL-Unit, FAN-x)

Table 8.9 How to Read Failure Information (Continues to the next page)

No.	Description	Failure detected messages		Failure recovery messages	
7	Disk Drive error/recovery	W060AT	SATA HDU alarm (Unit-x, HDU-y)	I007xy	HDU recovered (Unit-x, HDU-y)
		W060xy	HDU alarm (Unit-x, HDU-y)		
		W0GG00	HDU alarm [RKA] (Unit-x, HDU-y)		
		W0GH00	HDU alarm [RKAJ] (Unit-x, HDU-y)		
8	Spare Disk error/recovery	W061AT	SATA Spare HDU alarm (Unit-x, HDU-y)	I009xy	Spare HDU recovered (Unit-x, HDU-y)
		W061xy	Spare HDU alarm (Unit-x, HDU-y)		
		W0GJ00	Spare HDU alarm [RKA] (Unit-x, HDU-y)		
		W0GK00	Spare HDU alarm [RKAJ] (Unit-x, HDU-y)		
9	Loop error/recovery	W080xy	Loop alarm (Path-x, Loop-y)	I00Axy	Loop recovered (Path-x, Loop-y)
10	ENC Unit error/SENC Unit error/recovery	W090AT	SENC alarm (Unit-x, ENC-y)	I00Bxy	ENC recovered (Unit-x, ENC-y)
		W090xy	ENC alarm (Unit-x, ENC-y)		
		W0GA00	ENC alarm [RKA] (Unit-x, ENC-y)		
		W0GB00	SENC alarm [RKAAT] (Unit-x, ENC-y)		
		W0GC00	ENC alarm [RKAJ] (Unit-x, ENC-y)		
		W0GD00	SENC alarm [RKAJAT] (Unit-x, ENC-y)		
11	UPS	W0C000	UPS alarm (UPS-x)	I00D00	UPS recovered (UPS-x)
12	Path failure (detachment)/ recovery	W0F0xy	Path alarm (Remote-x, Path-y)	I030xy	Path recovered by web operation (Remote-x, Path-y)
				I031xy	Path recovered automatically
13	Occurrence/ rectification of an incomplete writing	W0G0xy	Unreadable PIN detected (Unit-x, HDU-y)	I04000	Unreadable PIN recovered
		W0G100	Unreadable PIN detected (Unit-*, HDU-*)		
14	Issue/callback of a resident LU off warning	W440xy	Permanent LU warning (CTL-x, ERR-y)	I1A2xy	Permanent LU warning recovered (CTL-x, ERR-y)

Table 8.9 How to Read Failure Information (Continued)

No.	Description	Failure detected messages		Failure recovery messages	
15	Excess/rectification of the threshold value of the number of pinned sub-segments	W49100	PIN is over directory threshold [write through] (DIR-x)	I6EG00	PIN over recovered [directory threshold] (DIR-x)
		W49300	PIN is over partition threshold [write through] (DIR-x, PTT-y)	I6EH00	PIN over recovered [partition threshold] (DIR-x, PTT-y)
		W49500	PIN is over RAID group threshold [write through] (DIR-x, RG-y)	I6EJ00	PIN over recovered [RAID group threshold] (DIR-x, RG-y)
16	The DM-LU failure/recovery	W49700	DM-LU write disable (LU-x)	I6EM00	DM-LU recovered (LU-x)
		W49800	All DM-LU write disabled		
17	The host connector failure/recovery	W0G300	Host connector alarm (Portxy-z)	I53A00	Host connector recovered (Portxy-z)
18	NNC (NAS Unit) failure and recovery	W5000x	NNC alarm (NNC-x)	IA1V0x	NNC recovered (NNC-x)
19	NNC (NAS Unit) partial failure and recovery	W5010x	NNC partial alarm (NNC-x)	IA1U0x	NNC recovered from partial alarm (NNC-x)

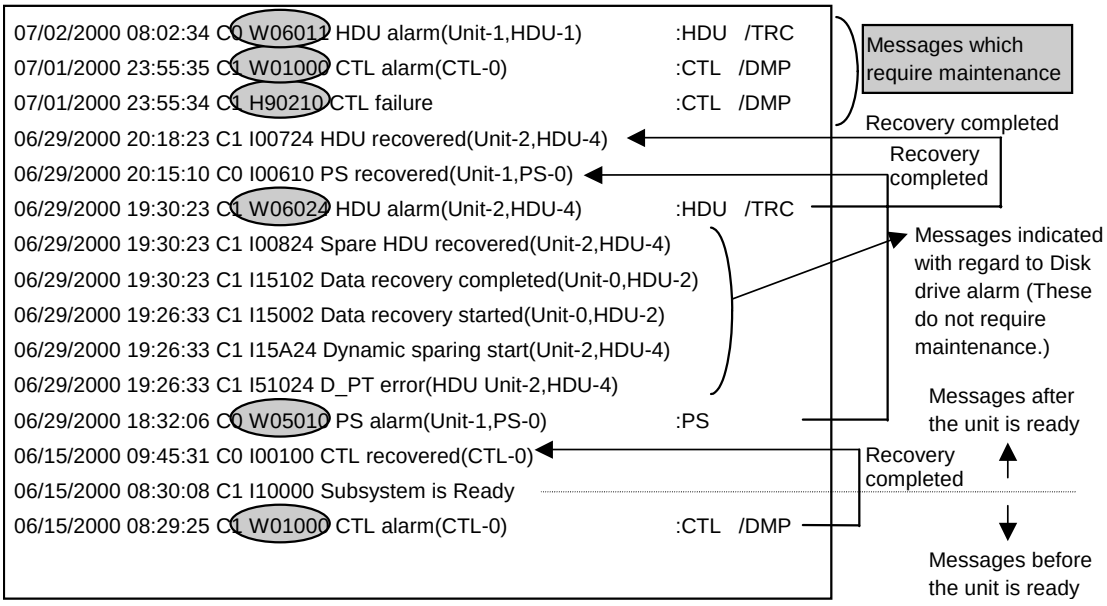
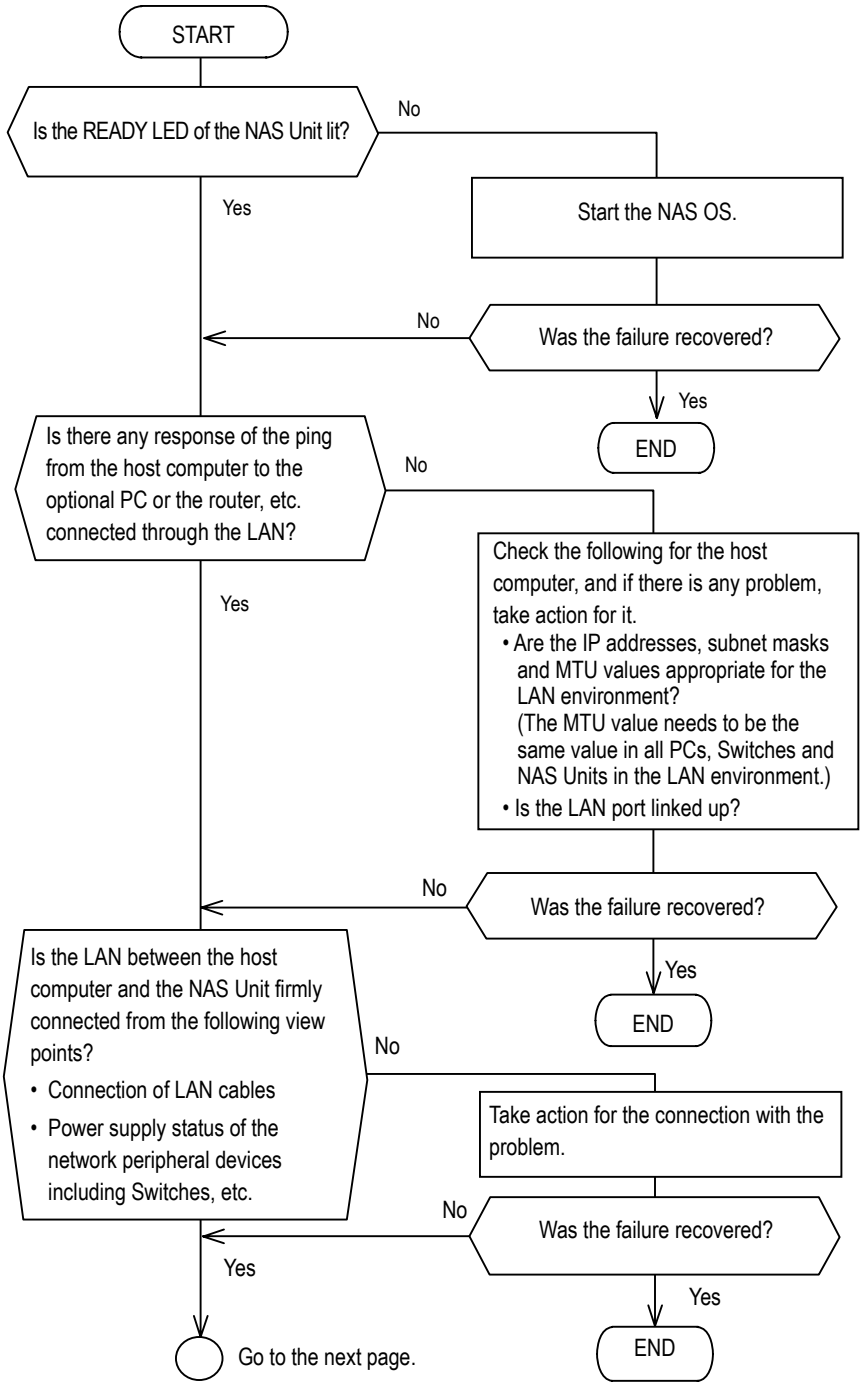
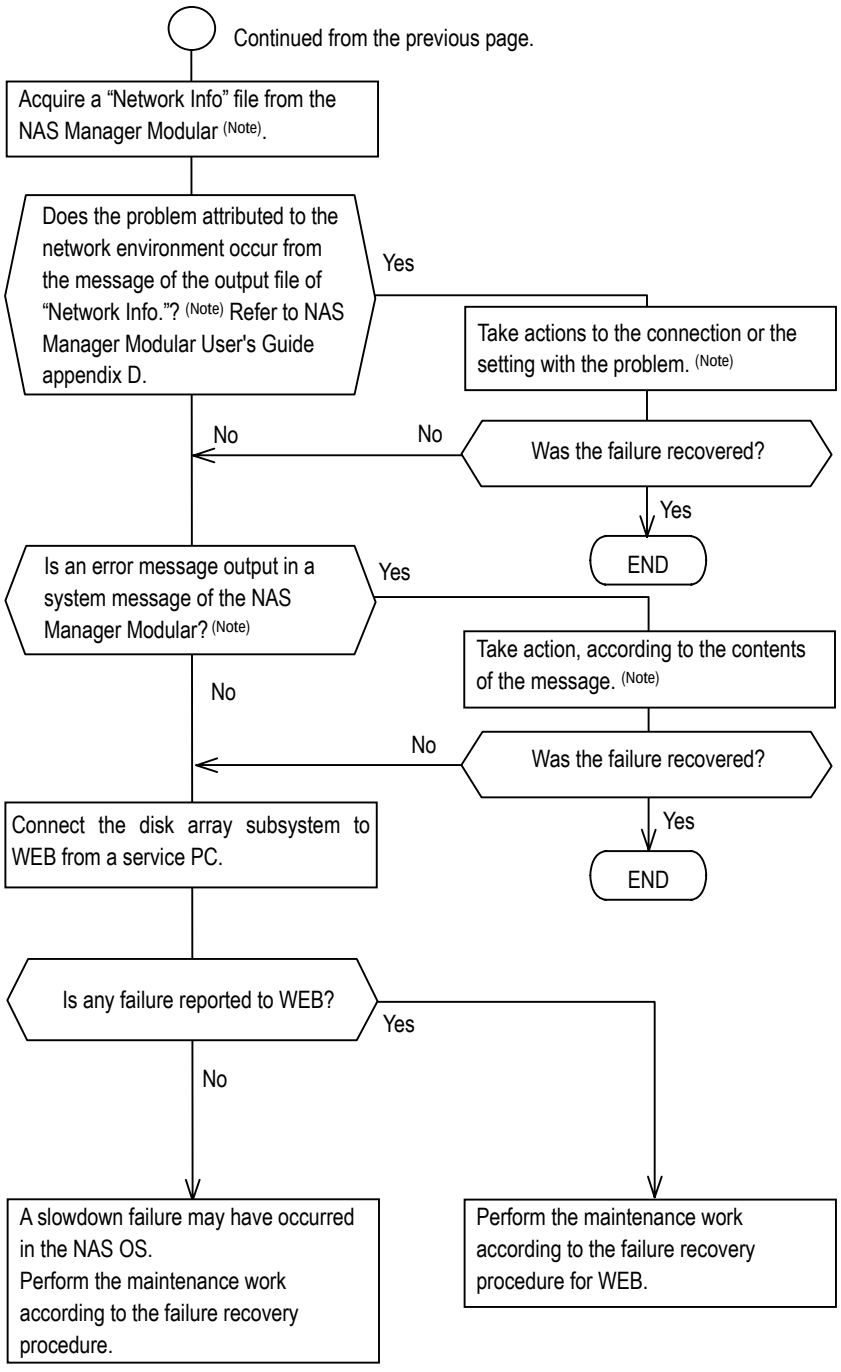

07/02/2000 08:02:34 C0 W06011 HDU alarm(Unit-1,HDU-1) :HDU /TRC
07/01/2000 23:55:35 C1 W01000 CTL alarm(CTL-0) :CTL /DMP
07/01/2000 23:55:34 C1 H90210 CTL failure :CTL /DMP
06/29/2000 20:18:23 C1 I00724 HDU recovered(Unit-2,HDU-4)
06/29/2000 20:15:10 C0 I00610 PS recovered(Unit-1,PS-0)
06/29/2000 19:30:23 C1 W06024 HDU alarm(Unit-2,HDU-4) :HDU /TRC
06/29/2000 19:30:23 C1 I00824 Spare HDU recovered(Unit-2,HDU-4)
06/29/2000 19:30:23 C1 I15102 Data recovery completed(Unit-0,HDU-2)
06/29/2000 19:26:33 C1 I15002 Data recovery started(Unit-0,HDU-2)
06/29/2000 19:26:33 C1 I15A24 Dynamic sparing start(Unit-2,HDU-4)
06/29/2000 19:26:33 C1 I51024 D_PT error(HDU Unit-2,HDU-4)
06/29/2000 18:32:06 C0 W05010 PS alarm(Unit-1,PS-0) :PS
06/15/2000 09:45:31 C0 I00100 CTL recovered(CTL-0)
06/15/2000 08:30:08 C1 I10000 Subsystem is Ready
06/15/2000 08:29:25 C1 W01000 CTL alarm(CTL-0) :CTL /DMP
Messages which require maintenance
Recovery completed
Recovery completed
Messages indicated with regard to Disk drive alarm (These do not require maintenance.)
Messages after the unit is ready
Recovery completed
Messages before the unit is ready

Figure 8.19 Message Analysis

8.5 Determining the Failure of the Network Side in the NAS System

When a failure occurs in the LAN environment between the host computer and the NAS Modular subsystem, or the NAS Modular subsystem, determine whether there is a failure in the NAS Modular subsystem according to the following flow.


START
Is the READY LED of the NAS Unit lit?
No
Yes
Start the NAS OS.
No
Was the failure recovered?
Yes
END
Is there any response of the ping from the host computer to the optional PC or the router, etc. connected through the LAN?
No
Yes
Check the following for the host computer, and if there is any problem, take action for it.
• Are the IP addresses, subnet masks and MTU values appropriate for the LAN environment? (The MTU value needs to be the same value in all PCs, Switches and NAS Units in the LAN environment.)
• Is the LAN port linked up?
No
Was the failure recovered?
Yes
END
Is the LAN between the host computer and the NAS Unit firmly connected from the following view points?
• Connection of LAN cables
• Power supply status of the network peripheral devices including Switches, etc.
No
Take action for the connection with the problem.
No
Was the failure recovered?
Yes
Yes
END
Go to the next page.


Continued from the previous page.
Acquire a “Network Info” file from the NAS Manager Modular (Note).
Does the problem attributed to the network environment occur from the message of the output file of “Network Info.”? (Note) Refer to NAS Manager Modular User's Guide appendix D.
Yes
Take actions to the connection or the setting with the problem. (Note)
No
No
Was the failure recovered?
Yes
END
Is an error message output in a system message of the NAS Manager Modular? (Note)
Yes
Take action, according to the contents of the message. (Note)
No
No
Was the failure recovered?
Yes
END
Connect the disk array subsystem to WEB from a service PC.
Is any failure reported to WEB?
Yes
No
A slowdown failure may have occurred in the NAS OS.
Perform the maintenance work according to the failure recovery procedure.
Perform the maintenance work according to the failure recovery procedure for WEB.

Note : Work to use NAS Manager Modular becomes charge of the system administrator.
The system administrator must cooperate with the maintenance member.

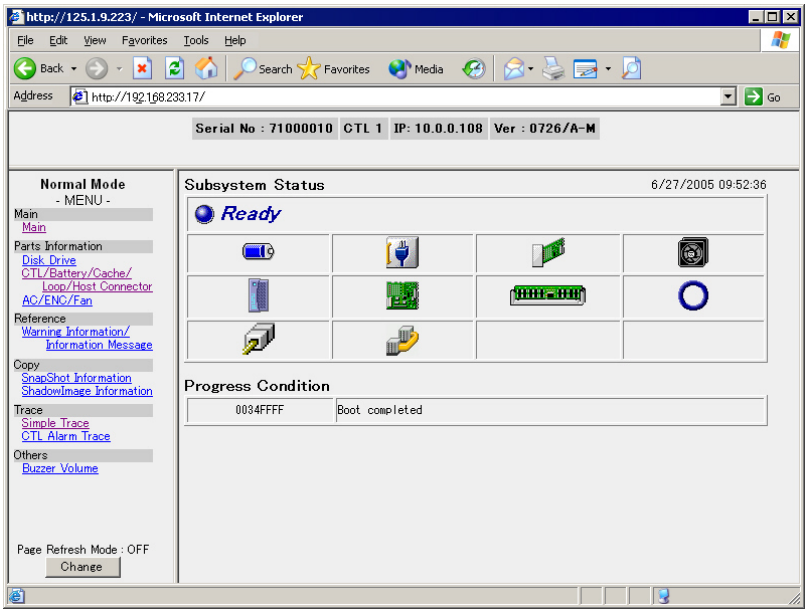
8.6 Connecting Failure in Connection with the Web

8.6.1 Collecting Simple Trace

This function is used to download current trace information. To perform the download, a free capacity of approximately 20 Mbytes is required in the PC.

Simple Trace of both the Control Units can be collected through one Control Unit.
It is not necessary to collect from both the controllers. (When it is collected from Control Unit #0, File name is “smpl_trc0.dat”. When collected from Control Unit #1, file name is “smpl_trc1.dat.”)

1. Click **Simple Trace** in the menu frame.



2. When the **Simple Trace** is clicked, the following window is displayed.



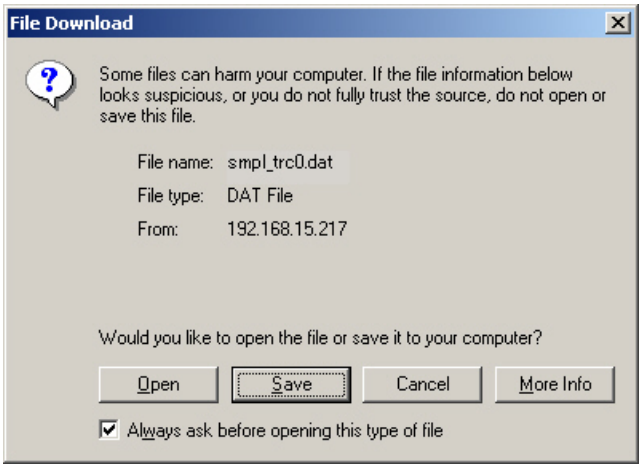
3. When the **OK** button is clicked, the following window is displayed.



4. The following window is displayed. Click the **Download** button.


Simple Trace - Microsoft Internet Explorer
Simple Trace
Simple Trace Download.
Do not close a window until the Trace file output is completed.
Download

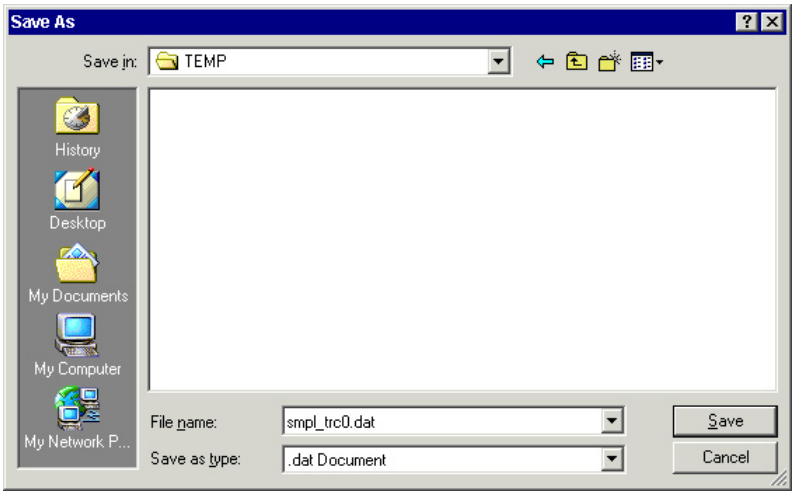
5. Click **Save**, if it is continued. Click **Cancel**, if it is stopped.


File Download
Some files can harm your computer. If the file information below looks suspicious, or you do not fully trust the source, do not open or save this file.
File name: smpl_trc0.dat
File type: DAT File
From: 192.168.15.217
Would you like to open the file or save it to your computer?
Open
Save
Cancel
More Info
Always ask before opening this type of file

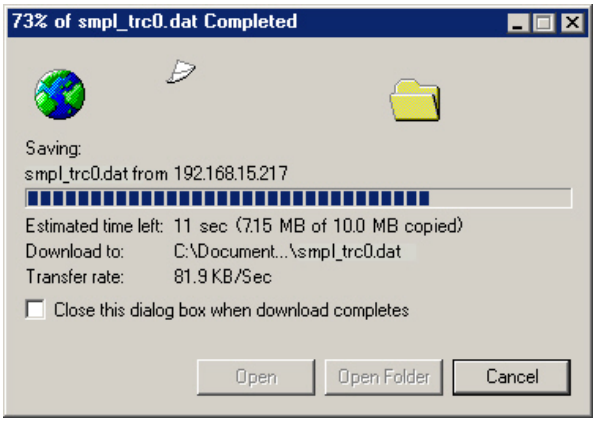
6. If the following window is displayed. Click **Save** after file name is setting, if it is continued. Click **Cancel**, if it is stopped.

   Note: There may be a case where the default file name is given as "ctla_trc0.dat.dat" depending on the setting of the PC. In this case, reset the file name to "ctla_trc0.dat" or any other name.

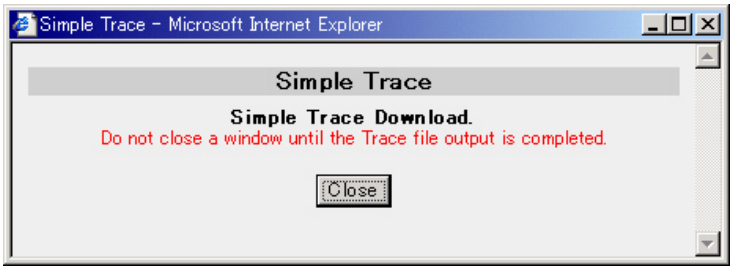
Click **Cancel**, if it is stopped.



7. The following window is displayed during execution download.



8. The progress message window is closed when the download is completed.
9. Click the **Close** button.


Simple Trace - Microsoft Internet Explorer
Simple Trace
Simple Trace Download.
Do not close a window until the Trace file output is completed.
Close

8.6.2 NAS Log Collection

This function downloads the log information on the present NAS OS. The free capacity of approximately 4 M bytes in the Normal Mode, 12 M bytes in the Detail Mode and 150 M bytes in the Full Mode is required on the PC for downloading.

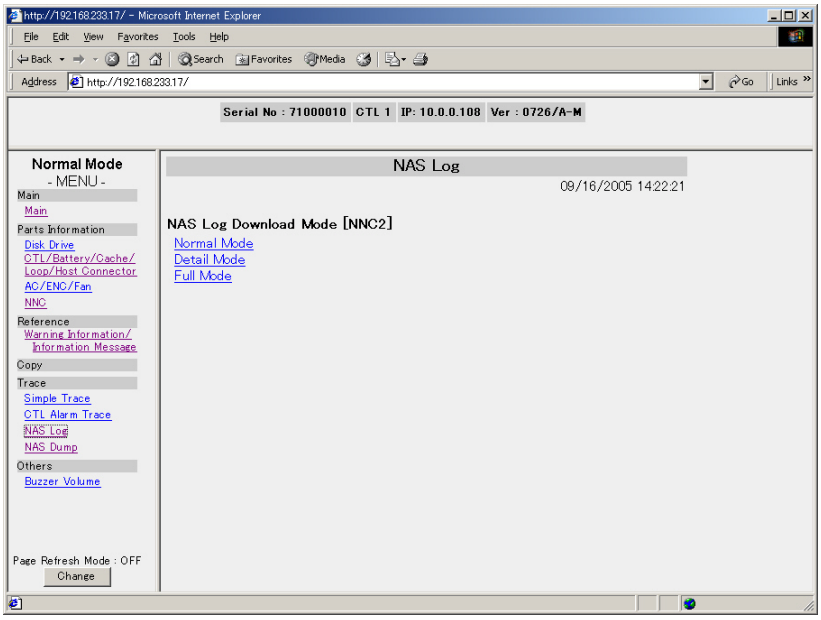
The NAS Log can collect only the information on the NNC (NAS unit) connected to the Control Unit. When no special instruction is given, collect the NAS log in Detail Mode when a failure occurs.

Table 8.10 Collection Mode

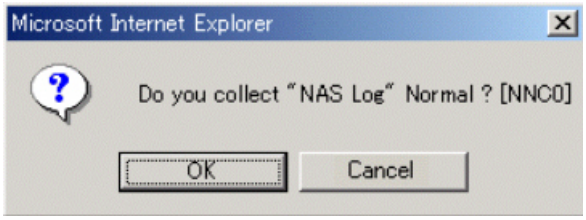
Collection Mode			
	Normal Mode	Detail Mode	Full Mode
Use	Collect it only when there is a special instruction. (It is limited to when the remote collection of Detail Mode is impossible on the capacity side.)	Collect "Detail Mode" uniformly unless otherwise instructed.	Collect it only when there is a special instruction. (It is limited to when the trouble analysis is impossible only with Detail Mode information.)

Note: For one control unit, do not collect the next NAS Log until the NAS Log collection processing is complete. The operation is not assured when NAS Log collection is performed at the same time from multiple WEBs and external application.

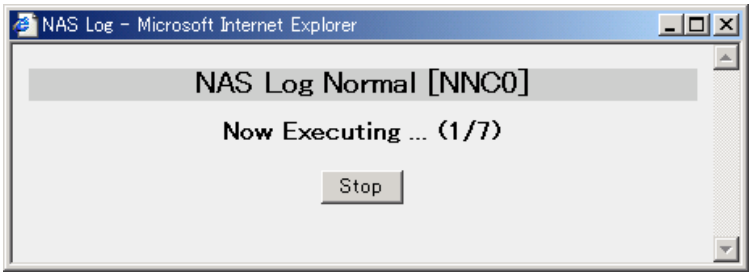
1. Click **NAS Log** in **Trace** of the menu frame.
2. Select the collection mode in **NAS Log**, and click it.



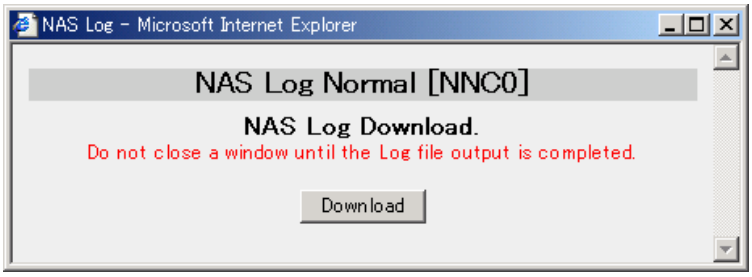
3. The confirmation message is displayed. Click the **OK** button.



The following dialog is displayed.

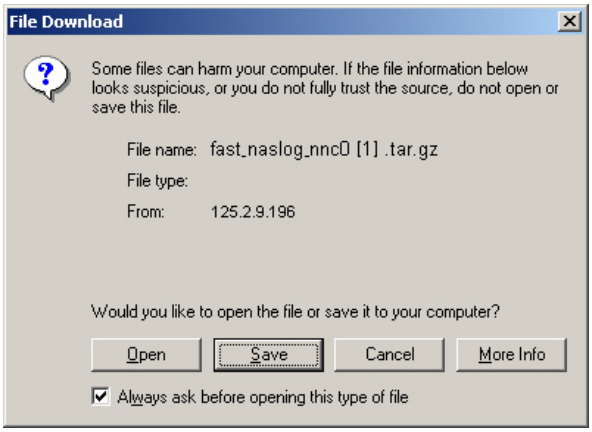


4. The following dialog is displayed when ending. Click the **Download** button.


NAS Log - Microsoft Internet Explorer
NAS Log Normal [NNC0]
NAS Log Download.
Do not close a window until the Log file output is completed.
Download

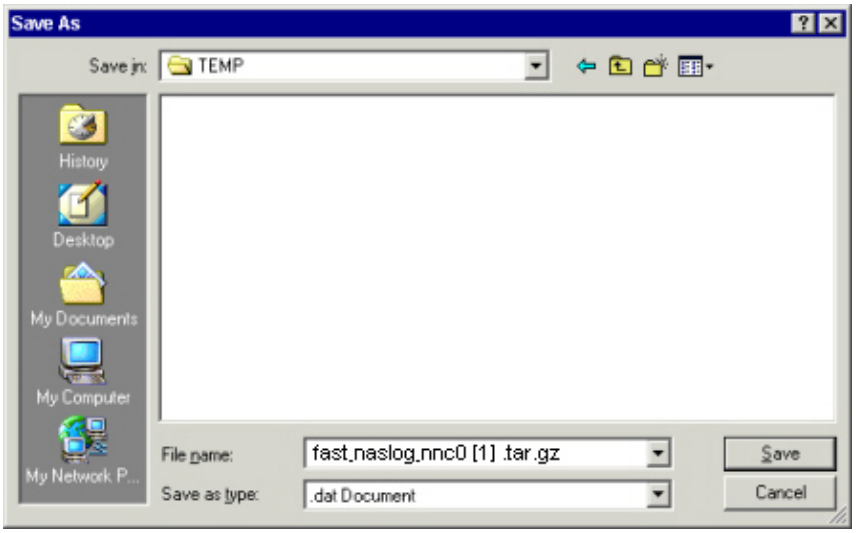
Note: Do not close this dialog while you download the NAS Log into the service PC. The NAS Log may not be able to be collected when closing it.

5. The following dialog is displayed. Click **Save**.


File Download
Some files can harm your computer. If the file information below looks suspicious, or you do not fully trust the source, do not open or save this file.
File name: fast_naslog_nnc0 [1] .tar.gz
File type:
From: 125.2.9.196
Would you like to open the file or save it to your computer?
Open
Save
Cancel
More Info
Always ask before opening this type of file

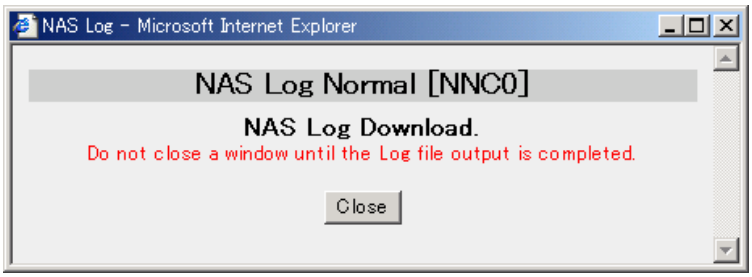
6. Specify the storage location of the file and the file name, and click **Save**.
   A file name can be changed to “optional file name.tar.gz”.
   A default file name is as follows in the collection mode.

	Collection Mode		
	Normal Mode	Detail Mode	Full Mode
NNC 0	fast_naslog_nnc0[1].tar.gz	naslog_nnc0[1].tar.gz	full_naslog_nnc0[1].tar.gz
NNC 2	fast_naslog_nnc2[1].tar.gz	naslog_nnc2[1].tar.gz	full_naslog_nnc2[1].tar.gz



   The downloading is started and the progress indicating message window is displayed.
   When the downloading completes, click **Close** button.

7. Click **Close** button.

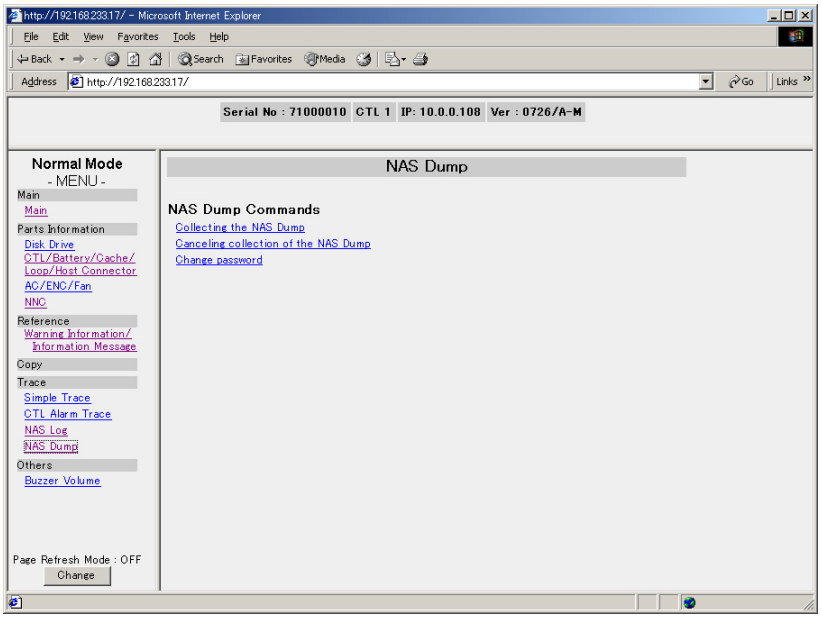

NAS Log - Microsoft Internet Explorer
NAS Log Normal [NNC0]
NAS Log Download.
Do not close a window until the Log file output is completed.
Close

8.6.3 NAS Dump Generation

This function generates the full memory information on the present NNC (NAS unit) and collects it in the Disk Drive. The full memory information on the NNC (NAS unit) is not downloaded in the PC at the NAS Dump generation opportunity. The generation of the NAS Dump can be executed only in the NNC (NAS unit) connected to the Control Unit.

8.6.3.1 Generating NAS Dump

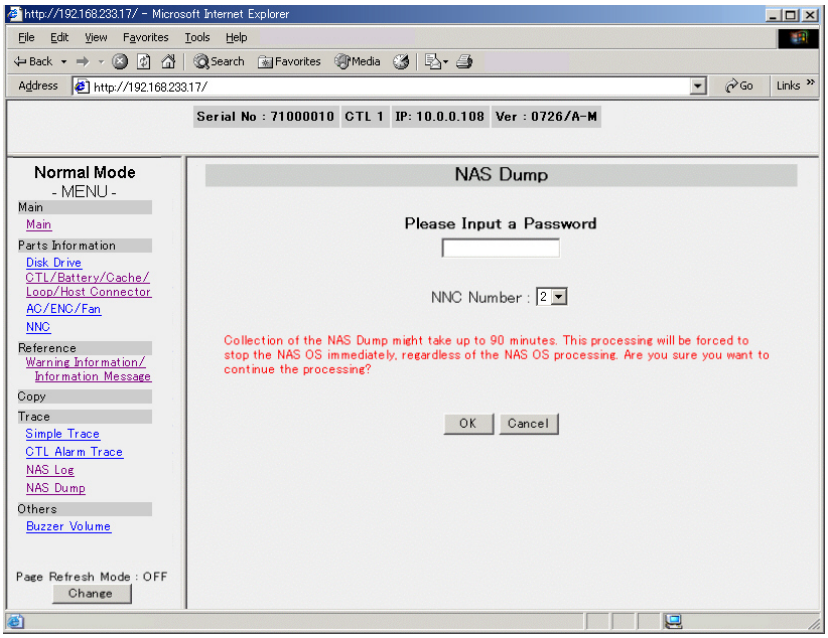
1. Click **NAS Dump** in **Trace** of the menu frame.
2. Select the **Collecting the NAS Dump**.



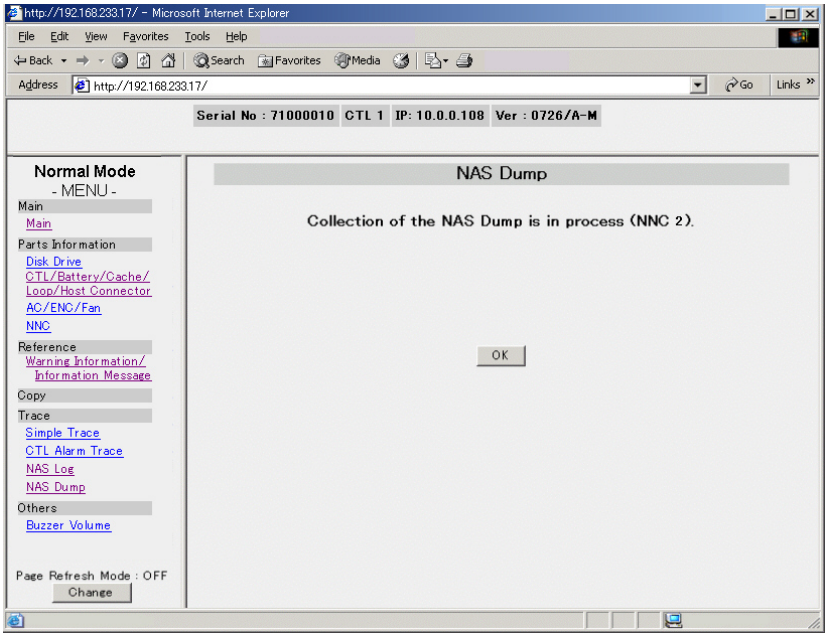
3. The confirmation message is displayed. Click the **OK** button.



4. Input the registered password, and click the **OK** button.
(The default password is “user=NAS”)

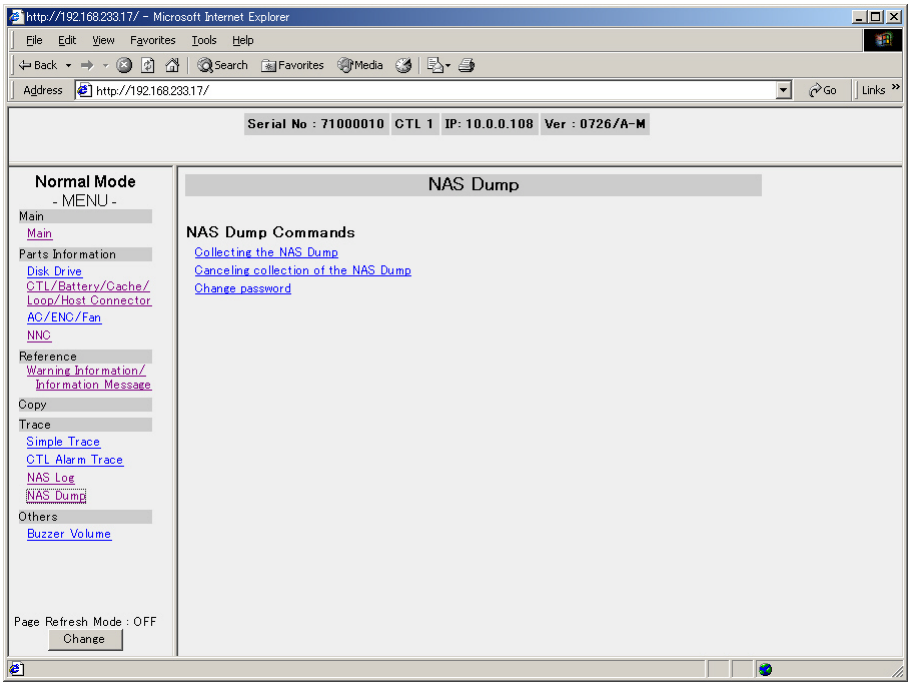


5. The following window is displayed. Click the **OK** button.

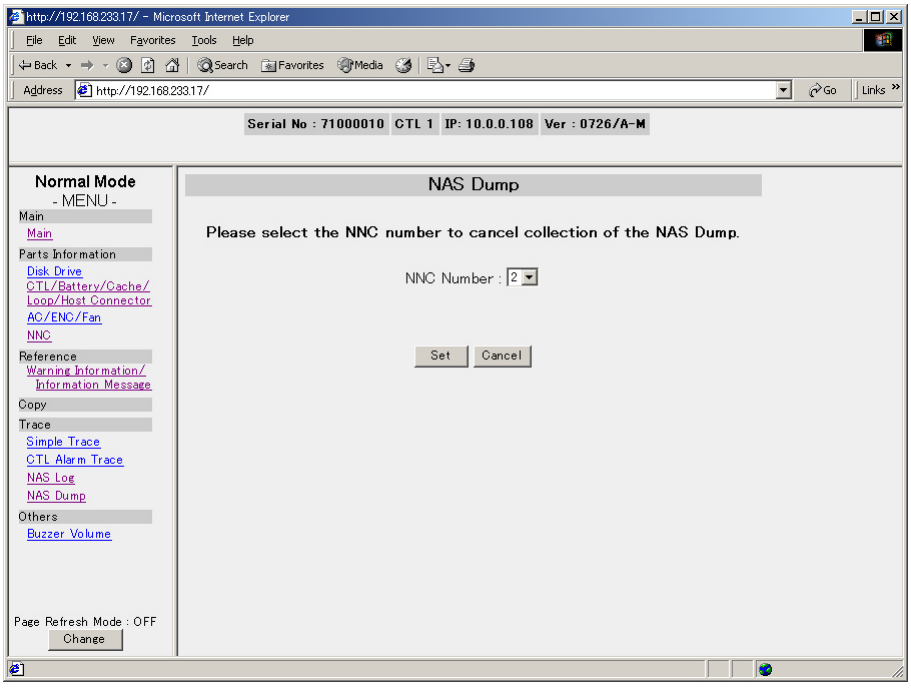


8.6.3.2 Suspension of the NAS Dump Generation

1. Select the **Canceling collection of the NAS Dump**.



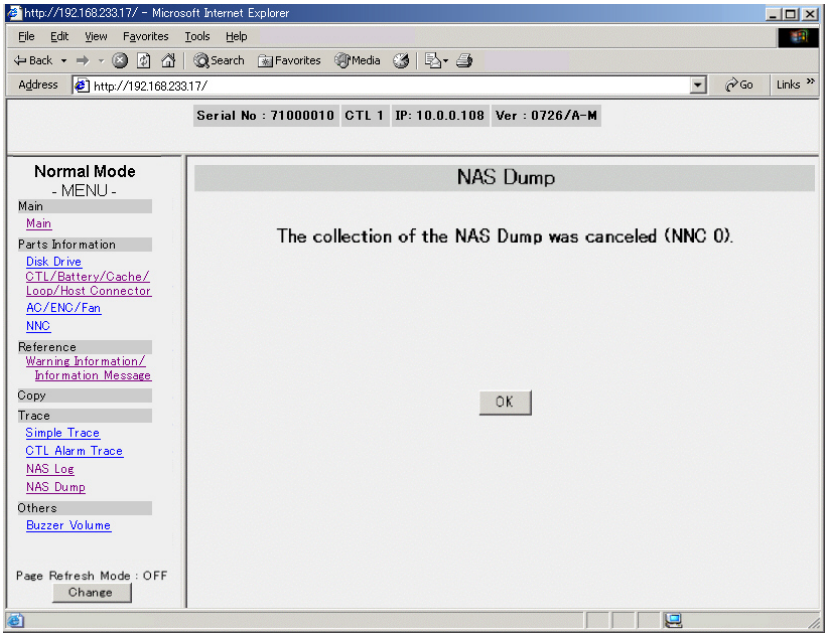
2. Specify the NNC(NAS Unit), which suspends the NAS Dump flushing, as “NNC Number”, and click the **Set** button.



3. The confirmation message is displayed. Click the **OK** button.

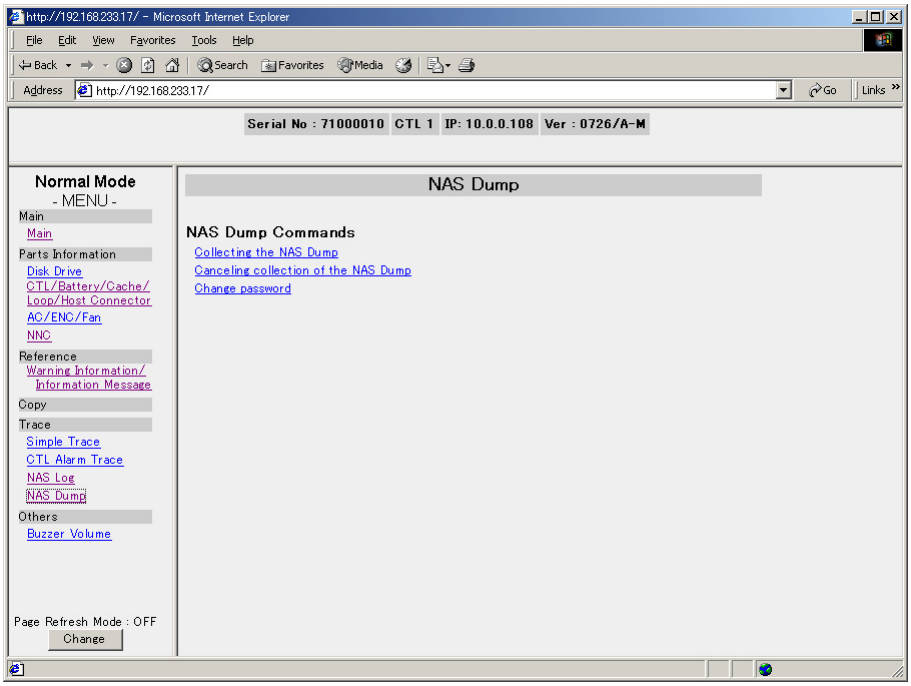


4. A suspension completion window is displayed. Click the **OK** button.

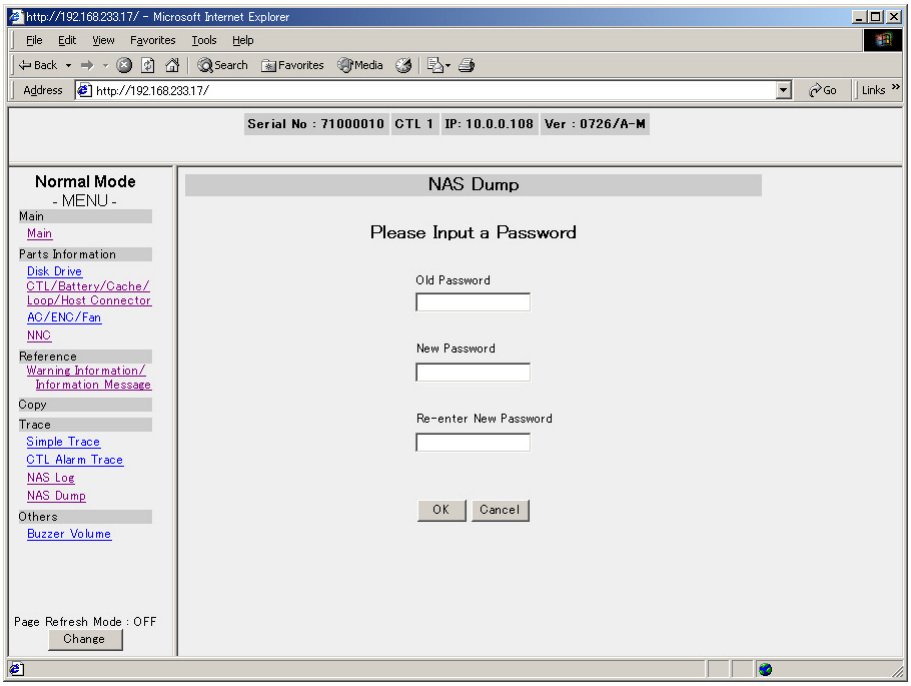


8.6.3.3 Registration and Change of the Password

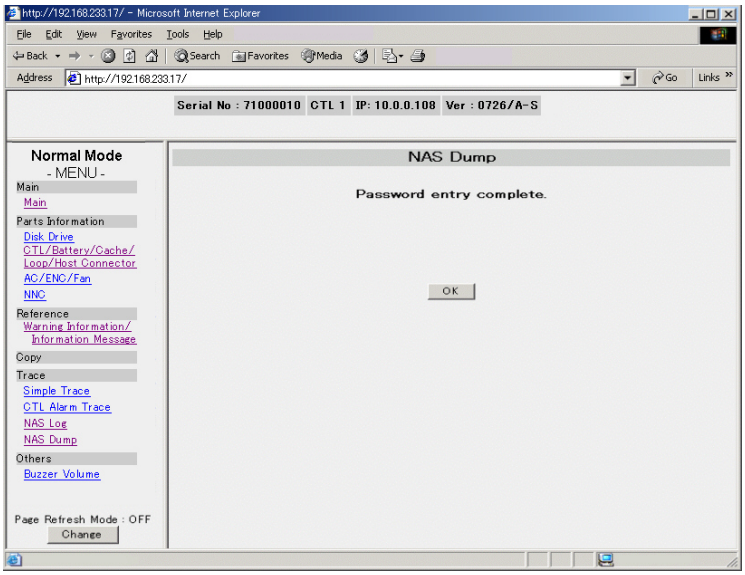
1. Select the **Change password**.



2. Input the **Old Password**, **New Password** and **Re-enter New Password** (one to eight digits in half size alphanumeric character) and then click the **OK** button.



3. The window, indicating the completion of the password registration, is displayed. Click the **OK** button.



8.7 Determining Failure on the Network Side of an iSCSI System

One of the following or two or more items are considered to be the causes that the host computer cannot communicate with the disk array subsystem. Check the validity of each item, and take necessary actions if there is any problem.

- The link status of LAN port in host computer is normal.
- All the Network peripherals (Switch, router, and NIC etc.) are powered on.
  if not, turn on the power.
- All the LAN cables between host computer and disk array subsystem are connected to the connector.
  If the LAN cable is connected loosely, connect it tightly.
- The port transfer rate of the HBA, Switch or NIC connected to the disk array subsystem is 1 Gbps.
  The port transfer rate of the disk array subsystem is 1 Gbps rate, and the communication mode is full-duplex.
- The VLAN setting is correct.
- The firewall setting is correct.
- The setting for L3 Switch or router is correct.
- The setting for the iSCSI driver of host computer is correct.
- The IPsec of the host computer is disabled for the iSCSI port of the disk array subsystem.
  The IPsec of the host computer needs to be disabled for the iSCSI port of the disk array subsystem.
- The setting of the IP address, subnet mask, default gateway and MTU value for both the disk array subsystem and the host computer meets the network.
  The MTU value needs to be set as the same value for all the devices (host computer, Switch, disk array subsystem, etc.) in the LAN network. The MTU value of DF700 is static and it is 1,500.
- The host computer recognizes the iSCSI driver.
- Doesn't it login with the correct IP address or the correct iSCSI Name of the Target is executed by the host computer.
- The TCP Port number of the iSCSI port of the subsystem is set correctly in the host computer.
- The "Discovery "and "Login" are executed by the host computer.
- The IP address of the iSNS server is set correctly in the host computer and disk array subsystem when iSCSI System has iSNS server.
- The iSNS server can newly register the information of the iSCSI device (IP address and iSCSI Name, etc.) when iSCSI System has iSNS server.
- The CHAP User of the Initiator is registered in the iSCSI port of the disk array subsystem when the Initiator authentication of the CHAP authentication is applied to the iSCSI System.
  If not, resister the CHAP User of the Initiator newly.

- The Target name (example: [000:T000]) of the Target is registered in the CHAP User of the Initiator at the disk array subsystem when the Initiator authentication of the CHAP authentication is applied to the iSCSI System.
- The User Name and its Secret of the Target are set correctly in the host computer when the Initiator authentication of the CHAP authentication is applied to the iSCSI System.
- The iSCSI Name of HBA on the assigned Initiator list of the Initiator at the disk array subsystem is assigned to the Target of the disk array subsystem when Target security of LUN Manager is enabled in the iSCSI port of the disk array subsystem.
  If not, assign the iSCSI Name of the HBA to the Target.

8.8 Calling the Acer | HDS Support Center

If you need to call the Acer | HDS Support Center, provide as much information about the problem as possible, including:

The circumstances surrounding the error or failure,

The exact content of any error messages displayed on the host system(s)

The worldwide Acer | HDS Support Centers are:

Hitachi Data Systems North America/Latin America
San Diego, California, USA
1-800-446-0744

Hitachi Data Systems Europe
Contact Hitachi Data Systems Local Support

Hitachi Data Systems Asia Pacific
North Ryde, Australia
011-61-2-9325-3300

Chapter 9 Periodic Maintenance

If the subsystem is not energized for more than three months, the battery may over-discharge and unrecoverable damage may result. In this situation, the battery must be energized more than 6 hours at least once every three months or, alternatively, the subsystem can be stored with the switch of the battery turned off. However, even when the switch is turned off, the battery discharges naturally. The battery should be charged once every six months for longer than 6 hours because spontaneous discharge occurs.

The following Appendices provide information on the Fibre, NAS, and iSCSI models. The following table illustrates sections that provide an explanation for each model.

- **Fibre model:** Connects disk array subsystem to a host computer with Fibre Channel interface.
- **NAS model:** Connects NAS Unit connected to disk array subsystem to a host computer with LAN interface.
- **iSCSI model:** Connects disk array subsystem to a host computer with iSCSI interface.

Sections		Fibre	NAS	iSCSI
Appendix A	Glossary	○	○	○
Appendix B	System Parameter Setting List	○	–	○
Appendix C	Basic Specifications of the Subsystem	○	○	○
Appendix D	D.1 Fibre Channel Connection Specifications	○	–	○
	D.2 Ethernet Connection Specifications	–	○	–
Appendix E	E.1 Remote Adapter Specifications	○	○	○
	E.2 Remote Adapter Dimensions	○	○	○
Appendix F	List of Storage Capacities Corresponding to RAID Levels and Configurations	○	○	○
Appendix G	Port Address Mapping Table	○	–	–
Appendix H	Power Cables	○	○	○
Appendix I	Number of Logical Blocks	○	○	○
Appendix J	Using LUN Security or LUN Management on a Fabric Switch Connection	○	–	–

○: The explanation is provided.
—: The explanation is not provided.

Appendix A Glossary

Cache backup	Because a cache memory uses DRAM, information stored in it is lost when the subsystem power is shut off. To provide against unexpected power failure, the subsystem has an setup to maintain data in the cache memory by batteries. Cache backup is a state in which the data is protected by the batteries.
CHAP (Challenge Handshake Authentication Protocol)	One of authentication methods. Security is high because authenticated information exchanged on network is encrypted by hash value.
CIFS	Common Internet File System CIFS is the extension of SMB protocol used in the file sharing service of the WIndows. The specification is disclosed so that the CIFS can be used in the OS other than Windows.
CSMA/CD (Carrier Sense Multiple Access with Collision Detection)	CSMA/CD is the LAN access method used in Ethernet. When a device wants to transmit data, it monitors the transmission status of a cable. If the cable is free, the device transmits data. If the cable is not free, the device waits a random amount of time before retrying. If more than two devices start a transmission at exactly the same time, a collision occurs in a cable. They both back off and wait a random amount of time before retrying. The CSMA/CD enables multiple devices to communicate sharing one cable.
CTL	Controller
CUDG	Control Unit Diagnosis
Data LAN interface	LAN interface in NAS unit that takes access from the NFS/CIFS client. User LAN interface provides Copper 4 ports for one NAS unit, and supports 1Gbit/s.
Destage	Automatically writes data in cache memory, not yet written on the disk drive, on the disk drive when the main switch is turned off.
DHCP	DHCP is an abbreviation for Dynamic Host Configuration Protocol; it is a client/server type protocol according to which a server automatically assigns an IP address when each client has started.
ECC	Error Checking and Correcting
EIA	Electronic Industries Alliance EIA standard (1 EIA unit = 44.45 mm)

FC-AL	Fibre Channel Arbitrated Loop
FC-SW	Fibre Channel-Switch Topology
Fibre channel (FC)	A set of standards of interfaces that are connected through optical fibre, etc. to achieve high-speed data transfer between devices.
Fibre Channel HBA	Fibre Channel Host Bus Adapter
Fibre Channel HUB	An apparatus to connect and relay Fibre Channel cables, each connected to a Fibre Channel device in order to form an arbitrated loop of the Fibre Channel.
Flash memory	ROM that can be electrically erased and reprogrammed. A type of EEPROM (Electrically Erasable and Programmable). It can retain information without electricity and is widely used as an external storage, etc.
Host computer	A computer which manages devices. For the disk array, it is a computer which enables the disk array store data.
Hot replacement	Used to replace an installed part with the subsystem power on. Usually, the major part is duplicated so that when one of the parts fails, the subsystem function is maintained by another part.
I/F	Interface
IP address	IP address is an abbreviation for Internet Protocol Address; it is a numeral string which shows an address of a computer connected to a network.
iSCSI (Internet Small Computer System Interface)	It is a protocol which is used to send and receive SCSI commands on IP network. Data can be transferred in a unit of block.
iSNS (Internet Storage Name Service)	iSNS is a name service for iSCSI. Targets on the network can be detected without setting target information to the initiator by user when using iSNS.
LA	Logical Address
LBA	Logical Block Address
LED	Light-Emitting Diode
LRC	Longitudinal Redundancy Check

Remote Maintenance Function (SNMP)	The SNMP agent support function reports failures to the workstation which monitors the network via the SNMP of the open platform.
R/W	Read/Write.
S-ATA(Serial-ATA)	S-ATA is an abbreviation for Serial Advanced Technology Attachment, and it is one of the extended specifications of IDE (Integrated Drive Electronics) standard for connecting a memory device such as HDDs. Serial ATA is a successor specification to the conventional ATA specification, changing from the parallel transmission mode, adapted in the existing ATA specifications such as Ultra ATA, to serial transmission mode. This enables S-ATA to provide fast transfer rate using simple cables, and S-ATA is compatible with conventional parallel ATA standards.
SNMP	SNMP is an abbreviation for Simple Network Management Protocol, and it is one of the network protocols developed to manage a network.
Spare disk	A disk drive which is mounted separately from the disk drives for usual write and read operation; when a failure occurs in a disk drive, data stored in the failed drive is copied to the spare disk drive so that the disk subsystem can continue to be available equivalently to the original subsystem.
System LU	Indispensable LU to NAS system. System LU indicates NAS OS LU, dump storage LU, failure information LU, NAS Shared LU, backup LU of NAS Shared LU and command device.
UPS	Uninterrupted Power Supply A backup power supply which is mounted on the AMS200 unit to prevent shutdown of the unit even when power stoppage or momentary power interruption occurs.
User LU	LU for storing user data in the NAS system.

Write cache	When data is written from a host computer onto a disk array subsystem, it is not written directly on the disk drive but written in cache memory. In this way, the disk array subsystem can return a writing completion report promptly. This writing method using cache memory is called write cache.

Appendix B System Parameter Settings List

The following table lists the parameter settings using the Storage Navigator-Modular.

	System Parameter	
1	System Startup Attribute	Depends on System Configuration
2	Drive Detach mode enable	Disable (Standard setting)
3	Turbo LU Warning	Disable (Standard setting)
4	Operation if the Processor failures Occurs	Reset a Fault (Standard setting)
5	ROM Microprogram Version	No change is needed
6	RAM Microprogram Version	No change is needed
7	Write & Verify Executing Mode	On (Standard setting)
8	DHCP (*Note 2*)	OFF (Standard setting)
9	Maintenance Port IP Address	To be set according to the network setting
10	IP Address	To be set according to the network setting
11	Subnet Mask	To be set according to the network setting
12	Default Gateway	To be set according to the network setting
Host Group		
1	LU Mapping Mode	Depends on the System Configuration (*Note 1*)
Target (*Note 3*)		
1	LU Mapping Mode	Depends on the System Configuration

Note 1: When the AMS200 is connected, the logical unit which is not wanted to be accessed by the port must be masked by means of the LU mapping mode.

Note 2: When the DHCP mode is validated, the IP Address is acquired from the DHCP server. If the DHCP server is not started up or the DHCP function has been wrongly set, the acquisition of the IP Address will fail and the IP Address of the subsystem will remain "0.0.0.0". (This is a state in which Storage Navigator-Modular or the Web cannot be used via a LAN.)

Note 3: Effective only when the iSCSI interface is added.

Table B.1 Host Connection Parameters

Host Group Option- Simple Setting						
Platforms		HP-UX®				
Alternate Path		None		PV Link		VxVM (see *Note1*)
Fail Over		None	MC/ Service Guard	None	MC/ Service Guard	None
Detail Setting: The following parameters will be selected automatically according to simple setting.						
Host Connection Mode 1 (Select one of these modes)	Standard Mode	✓	✓	✓	✓	✓
	Open VMS Mode					
	Wolfpack Mode					
	TRESPASS Mode					
Host Connection Mode 2 (Multiple selections)	HP-UX® Mode					
	PSUE Read Reject Mode					
	UA(06/2A00) Suppress Mode					
	NACA Mode					
	HISUP OFF Mode					
	Reset Propagation Mode					
	Unique Reserve Mode 1					
	ASL Report Mode (Active/Passive Group)					
	ASL Report Mode (Active/Passive)					
	ASL Report Mode (Active/Active)					
	Port ID No Report Mode					
	Port ID Conversion Mode					
	TruCluster Mode					
	Product Serial Response Mode					
	Same Node Name Mode					
	CCHS Conversion Mode					
	SPC-2 Mode					
Additional Parameter: Select these parameters only when you use the appropriate function. When selected, the following parameters belonged to the appropriate Host Connection Mode will be selected automatically.						
Logical Unit Number more than or equals to 8 can be recognized by HP-		HP-UX® Mode (see *Note2*)				
TrueCopy is used by HP-UX® (see *Note 3*)		PSUE Read Reject Mode				
VERITAS™ Database Edition/Advanced Cluster for Oracle® RAC (Solaris™) is used		Not Selected				
Egenera® BladeFrame® Is used		Not Selected				

✓: Parameter that is selected automatically by simple setting.

blank: Parameter that is selected manually if needed.

Note: When making the simple setting of the host group options, select items shown on gray backgrounds. Only when using the combination not described in the simple setting, select the required parameter from detail settings.

Note 1: When using VERITAS™ Volume Manager (VxVM), Array Support Library (ASL) for AMS/WMS Series is required. Please download from the Web screen of VERITAS™.

Note 2: Up to 256 logical units from logical unit number 0 to logical unit number 255 can be mapped for each host group. However, the maximum number of logical units a server can recognize is different depending on the platform.

Note 3: Do not select this parameter; TrueCopy Remote Replication is not supported.

Table B.2 Host Connection Parameters (continues on the next page)

Host Group Option- Simple Setting										
Platforms		Solaris™								
Alternate Path		None			HDLM (*Note1*)		VxVM (*Note2*)		MpxIO (*Note5*)	
Fail Over		None	Sun Cluster (*Note4*)	VCS *Note3*	None	Sun Cluster (*Note4*)	None	VCS *Note3*	None	Sun Cluster (*Note4*)
Detail Setting: The following parameters will be selected automatically according to simple setting.										
Host Connection Mode 1 (Select one of these modes)	Standard Mode	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Open VMS Mode									
	Wolfpack Mode									
	TRESPASS Mode									
Host Connection Mode 2 (Multiple selections)	HP-UX ®Mode									
	PSUE Read Reject Mode									
	UA(06/2A00) Suppress Mode									
	NACA Mode									
	HISUP OFF Mode									
	Reset Propagation Mode									
	Unique Reserve Mode 1									
	ASL Report Mode (Active/Passive Group)									
	ASL Report Mode (Active/Passive)									
	ASL Report Mode (Active/Active)									
	Port ID No Report Mode									
	Port ID Conversion Mode									
	TruCluster Mode									
	Product Serial Response Mode									
	Same Node Name Mode									
	CCHS Conversion Mode									
	SPC-2 Mode									
Additional Parameter: Select these parameters only when you use the appropriate function. When selected, the following parameters belonged to the appropriate Host Connection Mode will be selected automatically.										
Logical Unit Number more than or equals to 8 can be recognized by HP-UX®		Not Selected								
TrueCopy is used by HP-UX® (*Note 7*)		Not Selected								

Table B.2 Host Connection Parameters (continued)

Host Group Option- Simple Setting					
VERITAS™ Database Edition/Advanced Cluster for Oracle® RAC (Solaris™) is used	Not Selected	Unique Reserve Mode 1 (*Note6*)	Not Selected	Unique Reserve Mode 1 (*Note6*)	Not Selected
Egenera® BladeFrame® Is used	Not Selected				

✓: Parameter that is selected automatically by simple setting.
blank: Parameter that is selected manually if needed.

Note: When making the simple setting of the host group options, select items shown on gray backgrounds. Only when using the combination not described in the simple setting, select the required parameter from detail settings.

Note 1: When using Hitachi Dynamic Link Manager (HDLM), take notice of the following:
(1) Vendor ID: If this text is changed, it cannot be managed by HDLM. Do not change this text.
(2) Serial Number: When the multiple storages of same types exist, a different Serial Number needs to be allocated for each disk array subsystem.

Note 2: When using VERITAS™ Volume Manager (VxVM), Array Support Library (ASL) for AMS/WMS Series is required. Please download from the Web screen of VERITAS™.

Note 3: VERITAS™ Cluster Server.

Note 4: Sun™ Cluster.

Note 5: SUN™ Multi Path (MPxIO).

Note 6: When using VERITAS™ Storage Foundation For Oracle® RAC or the IO fencing function supported from the VCS Ver4.0, the Unique Reserve Mode 1 needs to be set.

Note 7: Do not select this parameter; TrueCopy Remote Replication is not supported.

Table B.3 Host Connection Parameters

Host Group Option- Simple Setting							
Platforms		AIX®					
Alternate Path		None		HDLM (*Note1*)		VxVM (*Note2*)	
Fail Over		None	HACMP	None	HACMP	None	VCS (*Note3*)
Detail Setting: The following parameters will be selected automatically according to simple setting.							
Host Connection Mode 1 (Select one of these modes)	Standard Mode	✓	✓	✓	✓	✓	✓
	Open VMS Mode						
	Wolfpack Mode						
	TRESPASS Mode						
Host Connection Mode 2 (Multiple selections)	HP-UX® Mode						
	PSUE Read Reject Mode						
	UA(06/2A00) Suppress Mode	✓	✓	✓	✓	✓	✓
	NACA Mode	✓	✓	✓	✓	✓	✓
	HISUP OFF Mode						
	Reset Propagation Mode		✓		✓		
	Unique Reserve Mode 1						
	ASL Report Mode (Active/Passive Group)						
	ASL Report Mode (Active/Passive)						
	ASL Report Mode (Active/Active)						
	Port ID No Report Mode						
	Port ID Conversion Mode						
	TruCluster Mode						
	Product Serial Response Mode						
	Same Node Name Mode						
	CCHS Conversion Mode						
	SPC-2 Mode						
Additional Parameter: Select these parameters only when you use the appropriate function. When selected, the following parameters belonged to the appropriate Host Connection Mode will be selected automatically.							
Logical Unit Number more than or equals to 8 can be recognized by HP-UX®		Not Selected					
TrueCopy is used by HP-UX® (*Note 5*)		Not Selected					
VERITAS™ Database Edition/Advanced Cluster for Oracle® RAC (Solaris™) is used		Not Selected					Unique Reserve Mode 1 (*Note4*)
Egenera® BladeFrame® Is used		Not Selected					

✓: Parameter that is selected automatically by simple setting.
blank: Parameter that is selected manually if needed.

Note: When making the simple setting of the host group options, select items shown on gray backgrounds. Only when using the combination not described in the simple setting, select the required parameter from detail settings.

Note 1: When using Hitachi Dynamic Link Manager (HDLM), take notice of the following:
(1) Vendor ID: If this text is changed, it cannot be managed by HDLM. Do not change this text.
(2) Serial Number: When the multiple storages of same types exist, a different Serial Number needs to be allocated for each disk array subsystem.

Note 2: When using VERITAS™ Volume Manager (VxVM), Array Support Library (ASL) for AMS/WMS Series is required. Please download from the Web screen of VERITAS™.

Note 3: VERITAS™ Cluster Server.

Note 4: When using VERITAS™ Storage Foundation For Oracle® RAC or the IO fencing function supported from the VCS Ver4.0, the Unique Reserve Mode 1 needs to be set.

Note 5: Do not select this parameter; TrueCopy Remote Replication is not supported.

Table B.4 Host Connection Parameters

Host Group Option- Simple Setting						
Platforms		Windows® 2000/2003				
Alternate Path		None		HDLM (*Note1*)		VxVM (*Note2*)
Fail Over		None	MSCS	None	MSCS	None
Detail Setting: The following parameters will be selected automatically according to simple setting.						
Host Connection Mode 1 (Select one of these modes)	Standard Mode	✓		✓	✓	✓
	Open VMS Mode					
	Wolfpack Mode		✓			
	TRESPASS Mode					
Host Connection Mode 2 (Multiple selections)	HP-UX® Mode					
	PSUE Read Reject Mode					
	UA(06/2A00) Suppress Mode					
	NACA Mode					
	HISUP OFF Mode					
	Reset Propagation Mode		✓		✓	
	Unique Reserve Mode 1					
	ASL Report Mode (Active/Passive Group)					
	ASL Report Mode (Active/Passive)					
	ASL Report Mode (Active/Active)					
	Port ID No Report Mode					
	Port ID Conversion Mode					
	TruCluster Mode					
	Product Serial Response Mode					
	Same Node Name Mode					
	CCHS Conversion Mode					
	SPC-2 Mode					
Additional Parameter: Select these parameters only when you use the appropriate function. When selected, the following parameters belonged to the appropriate Host Connection Mode will be selected automatically.						
Logical Unit Number more than or equals to 8 can be recognized by HP-UX®		Not Selected				
TrueCopy is used by HP-UX ® (*Note 3*)		Not Selected				
VERITAS™ Database Edition/Advanced Cluster for Oracle®RAC (Solaris™) is used		Not Selected				
Egenera® BladeFrame® Is used		Not Selected				

✓: Parameter that is selected automatically by simple setting.
blank: Parameter that is selected manually if needed.

Note: When making the simple setting of the host group options, select items shown on gray backgrounds. Only when using the combination not described in the simple setting, select the required parameter from detail settings.

Note 1: When using Hitachi Dynamic Link Manager (HDLM), take notice of the following:
(1) Vendor ID: If this text is changed, it cannot be managed by HDLM. Do not change this text.
(2) Serial Number: When the multiple storages of same types exist, a different Serial Number needs to be allocated for each disk array subsystem.

Note 2: When using VERITAS™ Volume Manager (VxVM), Array Support Library (ASL) for AMS/WMS Series is required. Please download from the Web screen of VERITAS™.

Note 3: Do not select this parameter; TrueCopy Remote Replication is not supported.

Table B.5 Host Connection Parameters

Host Group Option- Simple Setting								
Platforms		Linux®				Tru64®		Others Not specified
Alternate Path		None		VxVM *(Note1)*		None		None
Fail Over		None	VCS *(Note2)*	None	VCS *(Note2)*	None	Tru Cluster	None
Detail Setting: The following parameters will be selected automatically according to simple setting.								
Host Connection Mode 1 (Select one of these modes)	Standard Mode	✓	✓	✓	✓	✓	✓	✓
	Open VMS Mode							
	Wolfpack Mode							
	TRESPASS Mode							
Host Connection Mode 2 (Multiple selections)	HP-UX® Mode							
	PSUE Read Reject Mode							
	UA(06/2A00) Suppress Mode							
	NACA Mode							
	HISUP OFF Mode							
	Reset Propagation Mode							
	Unique Reserve Mode 1							
	ASL Report Mode (Active/Passive Group)							
	ASL Report Mode (Active/Passive)							
	ASL Report Mode (Active/Active)							
	Port ID No Report Mode							
	Port ID Conversion Mode							
	TruCluster Mode						✓	
	Product Serial Response Mode							
	Same Node Name Mode							
	CCHS Conversion Mode							
	SPC-2 Mode							
Additional Parameter: Select these parameters only when you use the appropriate function. When selected, the following parameters belonged to the appropriate Host Connection Mode will be selected automatically.								
Logical Unit Number more than or equals to 8 can be recognized by HP-UX®		Not Selected				Not Selected		Not Selected
TrueCopy is used by HP-UX® *(Note 4)*		Not Selected				Not Selected		Not Selected
VERITAS™ Database Edition/Advanced Cluster for Oracle® RAC (Solaris™) is used		Not Selected	Unique Reserve Mode *(Note3)*	Not Selected	Unique Reserve Mode *(Note3)*	Not Selected		Not Selected
Egenera® BladeFrame® Is used		Not Selected				Not Selected		Not Selected

✓: Parameter that is selected automatically by simple setting.
blank: Parameter that is selected manually if needed.

Note: When making the simple setting of the host group options, select items shown on gray backgrounds. Only when using the combination not described in the simple setting, select the required parameter from detail settings.

Note 1: When using VERITAS™ Volume Manager (VxVM), Array Support Library (ASL) for AMS/WMS Series is required. Please download from the Web screen of VERITAS™.

Note 2: VERITAS™ Cluster Server.

Note 3: When using VERITAS™ Storage Foundation For Oracle® RAC or the IO fencing function supported from the VCS Ver4.0, the Unique Reserve Mode 1 needs to be set.

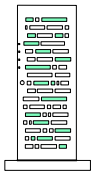
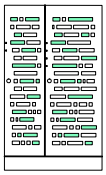
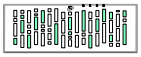
Note 4: Do not select this parameter; TrueCopy Remote Replication is not supported.

Appendix C Basic Specifications of the Subsystem

Basic specifications of AMS200 are shown in this chapter.

The basic specifications of AMS200 is listed and described in Table C.1, and the basic specifications of RKNAS is listed and described in Table C.2.

Table C.1 Basic Specifications of AMS200 (continues on the following pages)

Model	Item		Floor Model			Rack-Mount Model	
			Floor (RKS+H1J) Model	Floor (RKS+RKAJ+ H2J) Model	RKS	RKAJ	RKAJAT
Configuration	Configuration		-	-	1 RKS	1 RKAJ	1 RKAJAT
	Subsystem appearance						
Disk drive used	Disk drive size (W×D×H) (mm)		101.6×146.1×25.4				
	Data capacity (G byte) (*Note 1*)		71.3/143.3/287.6				245.7/393.4
	Rotational speed (min^{-1})		For 71.3/143.3 G bytes: 10,000/15,000 For 287.6G bytes: 10,000				7,200
	Maximum mountable quantity (unit)		15	30	15		
Host Interface	Interface type		2 G bps Fibre Channel Optional (Non-OFC) (*Note 3*) 1 G bps iSCSI (1000 Base-TX) (Note 5)			-	
	Data transfer speed (i.e. maximum speed for transfer to host)		200 M bytes/s (Fibre Channel) (*Note 4*) 100 M bytes/s (iSCSI) (Note 5)			-	
	# of host connectors	Single controller	Fibre Channel: 2 (*Note 2*) iSCSI: 2 (Note 5)			-	
		Dual controller	Fibre Channel: 4 (*Note 2*) SCSI: 4 (Note 5)			-	
	Transferred block size (bytes)		512			-	

Note 1: The values of storage capacity are calculated as 1 G bytes = 1,000,000,000 bytes. This definition is different from that (1 k bytes = 1,024 bytes) shown on the PCs you are using.

Note 2: When FC interface board is not added, one port configures one Mini-HUB, and extends to two host connectors.
When FC interface board is added, control unit implements two ports and two host connectors. One port configures FC interface independent of another port, and implements one host connector.
Note 3: When FC interface board is added, the interface type supports 4 Gbps Fibre Channel Optical (Non-OFC).
Note 4: When FC interface board is added, a maximum data transfer rate can be 400 M bytes/s (Fibre Channel) depending on the host I/O condition.
Note 5: Indicates the value when the iSCSI interface board is added to the control unit.

Table C.1 Basic Specifications of AMS200 (continued)

Model	Item		Floor Model			Rack-Mount Model	
			Floor (RKS+H1J) Model	Floor (RKS+RKAJ+ H2J) Model	RKS	RKAJ	RKAJAT
RAID specifications (*Note 1*)	RAID level (*Note 2*)		0/1/5/6/1+0				1/5/6/1+0
	RAID Config (Unit of addition)	RAID 0	2D to 15D	2D to 16D			-
		RAID 1	1D+1M				
		RAID 5	2D+1P to 14D+1P	2D＋1P～15D＋1P			
		RAID 6	2D+2P to 13D+2P	2D+2P to 28D+2P			
		RAID 1+0	2D+2D to 7D+7D	2D+2D to 8D+8D			
Internal logic specifications	Control CPU		Power PC7447A (500 G Hz)			-	
	Control memory		Flash memory: 2 M bytes L2 Cache memory: 512 k bytes SRAM: 64 M bytes			-	
	Data assurance method		Data bus: Through-parity Cache memory: ECC (1 bit for correction, 2 bits for detection) Disk drive: Data assurance code			-	
Physical specifications	Start-up time (min)		Standard: 3 (*Note 8*)			-	
	Chassis size (W×D×H) (mm)		260×737×540	309×737×540	483×650×174	483×650×129	
	Mass (kg) (*Note 3*)		70 approx.	115 approx.	56 approx.	40 approx.	
	Acoustic noise (dB) (*Note 7*)		56 approx.	59 approx.	57 approx.	60 approx.	
	Require height (EIA unit)		-		4	3	
Input power specifications	Input voltage (v)		AC 100/200 (100 to 120/200 to 240)				
	Frequency (Hz)		50/60 ±1				
	Number of phases, cabling		Single-phase with protective grounding				
	Steady-state current (A) (*Note5*) (*Note 6)*		4.0×2/2.0×2	4.0×2+2.6×2 /2.0×2+1.3×2	4.0×2/2.0×2	2.6×2/1.3×2	2.4×2/1.2×2
	Breaking current (A)		16.0			10.0	
	Heat value (kJ/h)		2,880 or less	4,755 or less	2,880 or less	1,875 or less	1,730 or less
	Required power	Steady State (VA)	800 or less	1,320 or less	800 or less	520 or less	480 or less
		Starting state (VA) (*Note 4*)	800 or less	1,360 or less	800 or less	560 or less	480 or less

Note 1: D: Data disk, P: Parity disk

Note 2: Although the subsystem with a configuration of RAID6, RAID 5, RAID 1, or RAID 1+0 provides data reliability enhanced by means of redundancy, a possibility remains that user data is lost owing to an unexpected failure of a host computer or hardware/software of the subsystem itself. Therefore, users are requested to back up all data for restoration in case where the original data is lost.
RAID 0+1 is described in place of RAID 1+0 in some places, however, it has the same meaning as RAID 1+0.

Note 3: Value of maximum configuration (in the case where all the mountable Disk drives and Controller are mounted).

Note 4: Power requirement in the case of the maximum configuration is shown. When planning facilities such as the uninterrupted power supply (UPS), specify the power factor as 100% for calculation. Value at 100 V/200 V is shown.
(Example: 300 W=300 VA)
The actual required power may exceed the value shown in the table when the tolerance is included.

Note 5: Power current of N×2 described in this table is required for operation by a single power supply unit.

Note 6: When one of the two power supply units fails, another power supply unit requires electric current for the two power supply units. Therefore, plan the power supply facility in which the current carrying capacity of one of the power supply units is a total capacity of the two power supply units.

Note 7: A noise emitted at the time of start is not included.

Note 8: The start-up time may be longer than three minutes depending on the configuration.

Note 9: It is recommended that the RAID level is configured within 6D+1P.

Table C.1 Basic Specifications of AMS200 (continued)

Model	Item	Floor Model			Rack-Mount Model	
		Floor (RKS+H1J) Model	Floor (RKS+RKAJ+H2J) Model	RKS	RKAJ	RKAJAT
Cache specifications	Capacity (M bytes/CTL)	1,024 to 2,048			-	
	Control method	Read LRU/Write after			-	
	Battery backup	Provided			-	
	Backup duration (h) (*Note 1*)	24 (When cache of 2,048 M bytes/CTL)			-	
Maintenance specifications/ antifault specifications	Spare disk	Up to fifteen of mounted Disk drives can be set to Spare disks				
	Display function	Status LEDs (POWER, READY, WARNING, and ALARM), LED of maintenance part				
Insulation performance	Insulation withstand voltage	AC 1,500 V (10 mA, 1 min)	AC 1,500 V (100 mA, 1 min)	AC 1,500 V (10 mA, 1 min)		
	Insulation resistance	DC 500 V, 10 M Ω or more				

Note 1:

- Non-volatility of data in the cache memory is ensured against power trouble such as a sudden power failure. It transfers data in the Cache memory to Disk drives by turning off the power normally, and prevents the battery charge from being wasted.
- When the subsystem enters the Cache Backup mode, a warning (lighting of the orange LED) informing of a voltage drop of the battery may be issued when the subsystem is started. It shows that the remaining capacity of the battery is not sufficient, and in this state, the subsystem operates disabling the Write Cache function automatically.

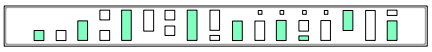
  When the battery is charged, the warning indication disappears, and the subsystem continues the operation enabling the Write Cache function.

  The warning indication disappears within 6 hours at the latest. Even when the warning is being indicated, normal functional operation is assured although the operation is performed in the Write-Through mode and the R/W performance is lowered because the Write Cache function is disabled.

  The battery is subject to the effect of the environmental temperature; therefore, avoid using a battery in unnecessarily continuous operation at a high temperature.
- If the subsystem is not energized for more than three months, over-discharging of the battery occurs and can result in unrecoverable damage. The battery must be energized more than 6 hours at least once a month, or the subsystem must be stored with the switch of the battery turned off. Even with the switch turned off, the battery discharges naturally. In this case, charge the battery once per six months for longer than 6 hours.

The following table lists and describes the basic specifications of RKNAS.

Table C.2 Basic Specifications of RKNAS

Items			RKNAS Specifications
Configuration	Configuration		1 RKNAS
	Subsystem appearance		
Physical specifications	Start-up time (min)		Standard: 3 (Note 3)
	Chassis size (W×D×H) (mm)		483×650×43
	Mass (kg)		15 approx.
	Acoustic noise (dB) (Note 1)		60 approx.
	Required height (EIA unit) (Note 2)		1
Input power specifications	Input voltage (V)		AC 100/200 (100 to 120/200 to 240)
	Frequency (Hz)		50/60 ±1
	Number of phases, cabling		Single-phase with protective grounding
	Steady-state current (A)		2.0/1.4
	Breaking current (A)		10.0
	Heat value (kJ/h)		1,010 or less
	Required power	Steady state (VA)	280 or less
		Starting state (VA) (Note 4)	280 or less

Note 1: No noise is emitted during start-up.

Note 2: The start-up time may be longer than three minutes depending on the configuration.

Note 3: Power requirement in the case of the maximum configuration is shown. When planning facilities such as the uninterrupted power supply (UPS), specify the power factor as 100% for calculation. Value at 100 V/200 V is shown.
(Example: 300 W=300 VA)
The actual required power may exceed the value shown in the table when the tolerance is included.

Appendix D Interfaces

Fibre Channel (Non-OFC) and Ethernet connections are used for Interface with the host computer. The AMS200 provides a Fibre Channel interface with the control unit as standard. The NAS unit and iSCSI interface provides an Ethernet interface as standard.

D.1 Fibre Channel Connection Specifications

D.1.1 System Configuration

Connecting the host computer and the AMS200 through the FC-SW enables you to configure a system that is logically connected with more devices than the combined number of ports. However, the maximum number of I/O processing ports for the host computer and TrueCopy remote replication is 128.

When constructing a system with the FC-AL or AC-SW:

- If you use the least Fibre Channel devices connected with a Fibre Channel loop, you will have superior higher performance.
- Since high-speed serial data transfer is performed via Fibre Channel, use high-quality Fibre Channel cables which conform to the FC-PH standard.

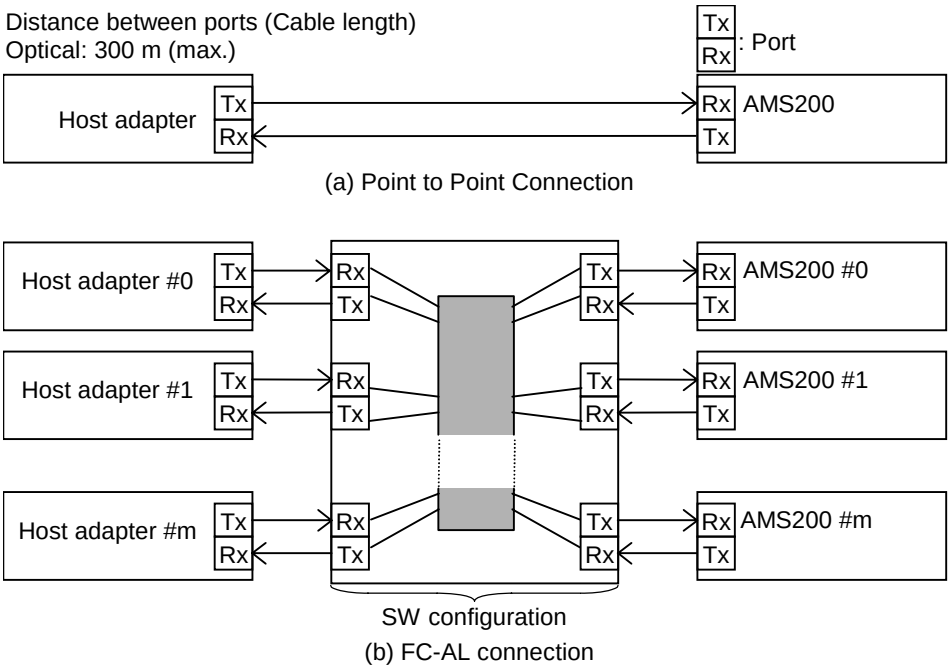


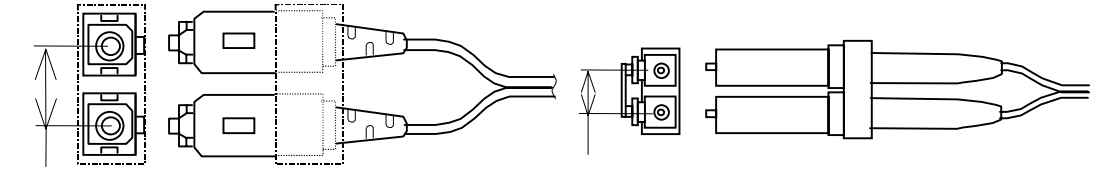
Figure D.1 Fibre Channel Connection Specifications

D.1.2 Cable

Table D.1 shows specifications of the Fibre Channel interface cable. Figure D.1 shows the type of connector for the optical interface on the cable side.

Table D.1 Cable Specification

Cable Type	Interface Type	Cable Node Name	Nominal		
			Cable	Connector	
				One Side	Other Side
SC-LC cable	Optical	Equivalent to Sumitomo 3M 170AC-AAAA-XXX	50/125 μm Multimode	SC connector (JIS C 5973)	LC connector
LC-LC cable			Wavelength: 850 nm	LC connector	LC connector



(a) SC connector type (b) LC connector type

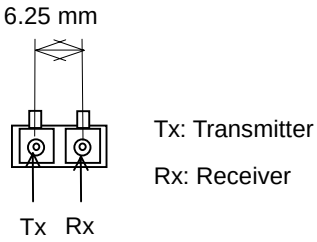
Figure D.2 Cable Side Connector

D.1.3 Connector on Subsystem Side

Figure D.1 displays the type of connector for the optical interface on the subsystem side.

- **LC Connector Type:**

  Connector type: LC duplex receptacle connector.
  Interval: 6.25 mm flat type two rows.



LC connector type

Figure D.3 Connector Shape

D.1.4 Ordered Set

Table D.2 displays the Ordered Sets defined by the Fibre Channel interface.

Table D.2 Ordered Set

No.	Classification	Name
1	Frame Delimiters	SOF (Start of Frame)
2		EOF (End of Frame)
3	Primitive Signals	IDLE
4		R_RDY (Receiver_Ready)
5		ARBx (Arbitrate)
6		OPNyx (Open full-duplex)
7		OPNyy (Open half-duplex)
8		OPNfr (Open broadcast replicate)
9		OPNyr (Open selective replicate)
10		CLS (Close)
11		MRKtx (Mark)
12	Primitive Sequence	NOS (Not Operational)
13		OLS (Off-line)
14		LR (Link Reset)
15		LRR (Link Reset Response)
16		LIP (Loop Initialization)
17		LPEyx (Loop Port Enable)
18		LPEfx (Loop Port Enable all)
19		LPByx (Loop Port Bypass)

- **Frame Delimiters**

  The Frame Delimiter is an Ordered Sets that immediately precedes or follows a frame context, and consists of the SOF (Start of Frame) and the EOF (End of Frame).

- **SOF (Start of Frame)**

  The SOF delimiter is an Ordered Set that immediately precedes the context of a frame. There are following SOF delimiters, shown in the Table D.3, based on the service class, etc.

Table D.3 SOF Delimiters

No.	Name	Meaning	Remarks
1	SOFc1	A frame delimiter to be used to require the exclusive connection of the Class 1 service. Since the subsystem does not support the Class 1 service yet, it responds with R_RJT (Class not Supported) as to the frame.	
2	SOFi1	A frame delimiter to be used when starting the sequence following the exclusive connection of the Class 1 service. Since the subsystem does not support the Class 1 service yet, it responds with R_RJT (Class not Supported) as to the frame.	
3	SOFi2	This is used for the first frame that starts the sequence of the Class 2 service. Since the subsystem does not support the Class 2 service yet, it responds with R_RJT (Class not Supported) as to the frame.	
4	SOFi3	This is used for the first frame that starts the sequence of the Class 3 service.	
5	SOFn1	This is used for frames other than the first frame of the sequence of the Class 1 service. Since the subsystem does not support the Class 1 service yet, it responds with R_RJT (Class not Supported) as to the frame.	
6	SOFn2	This is used for frames other than the first frame of the sequence of the Class 2 service. Since the subsystem does not support the Class 2 service yet, it responds with R_RJT (Class not Supported) as to the frame.	
7	SOFn3	This is used for frames other than the first frame of the sequence of the Class 3 service.	

- **EOF (End of Frame)**

  The EOF delimiter is an Ordered Set that immediately follows the context of a frame. There are following EOF delimiters, shown in the Table D.4, based on the service class, etc.

Table D.4 EOF Delimiters

No.	Name	Meaning	Remarks
1	EOFt	This shows that the sequence of the SEQ_ID which is owned by a frame.	
2	EOFdt	This is used to cancel the exclusive connection. This identifies the final ACK of the sequence and shows that the sequence of the SEQ_ID owned by a frame has completed.	Class 1 is not supported.
3	EOFn	This is used when no other EOF delimiter (EOFt or EOFdt) which shows valid frame contents is required.	
4	EOFdti	When the EOFdt has illegal contents, it is replaced with the EOFdti.	
5	EOFni	When the EOFt or EOFn has illegal contents, it is replaced with the EOFni.	
6	EOFa	This is used to terminate a partial frame owing to an error occurred during a transfer. A receiver must abandon the frame without making any response.	

- **Primitive Signals**

  A Primitive Signal a signal that has special meaning. The following Primitive Signals are defined.

  IDLE:
  An IDLE is a Primitive Signal transmitted on the link to indicate an operational Port facility is ready for frame transmission and reception. The IDLE is transferred when no frame, R_RDY, or primitive sequence is being transferred on a link.

  R_RDY (Receiver Ready):
  The R_RDY indicates that a single Class 1 connect-request (SOFc1), Class 2, or Class 3 frame was received and that the interface buffer which received the frame is available for further frame reception.

  ARBx (Arbitrate) --- FC-AL:
  An ARBx is a Primitive Signal transmitted on a Loop by a participating L_Port to request access to the Loop. It may be sent instead of the IDLE when the AMS200 is connected to the FC-AL.

  OPNyx (Open full-duplex) --- FC-AL:
  An OPNyx is a Primitive Signal transmitted on a Loop by a participating L_Port to indicate that it is ready for Data and Link Control frame transmission and reception.

  OPNyy (Open half-duplex) --- FC-AL:
  An OPNyy is a Primitive Signal transmitted on a Loop by a participating N_Port to indicate that it is ready for Data and Link Control frame transmission and Link Control frame reception.

  OPNfr (Open broadcast replicate) --- FC-AL:
  An OPNyy is a Primitive Signal transmitted on a Loop by a participating L_Port which desires to communicate with all participating L_Ports on the Loop.

  OPNyr (Open selective replicate) --- FC-AL:
  An OPNyr is a Primitive Signal transmitted on a Loop by a participating L_Port which desires to communicate with a subset of L_Ports on the Loop.

CLS (Close) --- FC-AL:
A CLS is sent by the L_Port. When the L_Port sends the CLS, it does not transfer the frame and the R_RDY to the current circuit.
The CLS shows that the control of the loop is ready to be abandoned or has already been abandoned.

MRKtx (Mark) --- FC-AL:
A MRKtx is a Primitive Signal transmitting on a Loop by a master control point to synchronize other Nodes.

- **Primitive Sequences**

  A Primitive sequences form an ordered set and they are transferred repeatedly and continuously while the certain condition exists. Types of the primitive sequence are shown below.

  NOS (Not Operational):
  The NOS Primitive Sequence is transmitted to indicate that the Port transmitting this Sequence has detected a Link Failure condition or is Off-line, waiting for OLS to be received.

  OLS (Off-line):
  The OLS Primitive Sequence is transmitted to indicate that the port transmitting this Sequence is:

  - Initiating the Link Initialization Protocol,
  - Receiving and recognizing NOS, or
  - Entering the Off-line State

  LR (Link Reset):
  The LR Primitive Sequence is transmitted by a Port to initiate the Link Reset Protocol or to recover from a Link Time-out. Besides, the LR is possible to be sent when the N_Port which supports the Class 1 service becomes unable to decide the connection status.

  LRR (Link Reset Response):
  The LRR Primitive Sequence is transmitted by a Port to indicate that it is receiving and recognizes the LR Primitive Sequence.

  LIP (Loop Initialization) --- FC-AL:
  The LIP Primitive Sequence is used by an L_Port to detect if it is part of a Loop or to recover from certain Loop errors.

  LPEyx (Loop Port Enable) ---FC-AL:
  The LPEyx is sent on the loop to reset the bypass circuit of the L_Port which was bypassed before and to put the L_Port in the enabled status.

  LPEfx (Loop Port Enable all) --- FC-AL:
  The LPEfx Primitive Sequence is transmitted on a Loop to reset all Bypass Circuit(s) that may have been previously set and enable all L_Port to participate on the Loop.

  LPByx (Loop Port Bypass) --- FC-AL:
  The LPByx Primitive Sequence is transmitted on a Loop to set the Bypass Circuit and to bypass an L_Port.

D.1.5 Frames

- **Frame Format**

  Table D.5 displays the frame format used with Fibre Channel.

Table D.5 Frame Format

Start of Frame (SOF)	Frame Header	Data File	CRC	End of Frame (EOF)
4 bytes	24 bytes	0 to 2112 bytes	4 bytes	4 bytes

Start of Frame:
The Start of Frame (SOF) delimiter is an Ordered Set that immediately precedes the frame context.
For the types of the SOF, refer to D.1.4).

Frame Header:
The Frame Header is used by the link control facility to control link operations, control device protocol transfers, and detect missing or out of order frames.

Data Field:
This field can take the following size depending on the frame type. (Note)

Link control frame: Data Field length = 0.

Data frame: Data Field length = 0 to 2112.

The optional header (Note) may be supplied at the top of the Data Field of the data frame.
The data described in the data frame is Data Field excluding the option header.
This portion is called payload.

Note: The frame type and presence or absence of the optional header are prescribed by the Frame Header.

CRC:
The CRC is the Cyclic Redundancy Check code for checking data in the Frame Header and Data Field.

End of Frame:
The End of Frame (EOF) is a frame delimiter for identifying the end of a frame.

- **Header**

  The format of the Frame Header is shown in Table D.6.

Table D.6 Frame Format

Bits/Word	31 to 24	23 to 16	15 to 08	07 to 00
0	R_CTL	D_ID		
1	Reserved	S_ID		
2	TYPE	F_CTL		
3	SEQ_ID	DF_CTL	SEQ_CNT	
4	OX_ID		RX_ID	
5	Parameter			

R_CTL (Routing Control):
The R_CTL field is used to categorize the frame function. Classification into the link control frame and data frame is done by the R_CTL.

D_ID (Destination ID):
The D_ID field contains the address identifier of an N_Port or F_Port within the destination entity.

S_ID (Source ID):
The S_ID field contains the address identifier of an N_Port or F_Port within the source entity.

TYPE (Data Structure Type):
The TYPE field identifies the protocol of the frame content for Data Frames.

F_CTL (Frame Control):
The F_CTL field contains control information relating to the frame contents.
The control information includes the Exchange Context, Sequence Context, etc.

SEQ_ID (Sequence ID):
The SEQ_ID field contains the SEQ_ID assigned by the Sequence Initiator, and it shall be unique for a specific D_ID and S_ID pair while the Sequence is Open.

DF_CTL (Data Field Control):
The DF_CTL field specifies the presence of optional headers at the beginning of the Data Field.

SEQ_CNT:
The SEQ_CNT field indicates the sequential order of Data Frame transmission within a single sequence or multiple consecutive sequences for the same Exchange.

OX_ID (Originator Exchange ID):
The OX_ID field identifies the Exchange ID assigned by the Originator of the Exchange. Each Exchange shall be assigned an identifier unique to the Originator or Originator-Responder Pair.

RX_ID (Responder Exchange ID):
The RX_ID is an identifier of the exchange assigned by the responder of the exchange. It is unique and locally significant for the responder.

Parameter:
In the link control frame, the parameter is used to transmit original information of the individual link control frame and in the data frame, it is used for the relative offset.

- **Header**

The presence of the Optional Headers is indicated by the DF_CTL field. The treatment of the Optional Headers with the AMS200 is shown in Table D.7.

Table D.7 Frame Format

No.	Name	Usage	Treatment with the Disk Array	Remarks
1	Expiration Security Header	Used to specify the expiration time, etc. of the frame.	Ignores this header and processes the command.	16 bytes
2	Network Header	Used by a bridge or a gateway node which interfaces to an external Network.	Ignores this header and processes the command.	16 bytes
3	Association Header	Used to identify the process or process group.	Ignores this header and processes the command.	32 bytes
4	Device Header	Used by the upper level protocol.	Ignores this header and processes the command.	16 bytes 32 bytes 64 bytes

The AMS200 does not add Optional Headers in a Data frame to be sent to other N_Ports.
The host computer shall not add Optional Headers in a frame sent to the AMS200.
If the Optional Headers are added in the Data frames sent to the subsystem, correct operation in the AMS200 is not guaranteed.

- **Link Control Frames**

  Table D.8 displays the defined Link Control frames (FT-0) and supports Link Control frames. The AMS200 supports link service frames shown in Table D.9.

Table D.8 Link Control Frames

No.	Name	Meaning	Support
1	ACK_1 (Acknowledge_1)	Indicates that a single Data frame is being acknowledged.	○ (*Note*)
2	ACK_0 (Acknowledge_0)	Indicates that all Data frames of a Sequence are being acknowledged.	×
3	ACK_N (Acknowledge_N)	Indicates that N consecutive Data frames of a Sequence are being acknowledged.	×
4	P_RJT (N_Port Reject)	Indicates that delivery of a frame is being denied. A four byte reject action and reason code is contained in the Parameter field.	○
5	F_RJT (Fabric Reject)	Indicates that delivery of a frame is being denied. A four byte reject action and reason code is contained in the Parameter field.	○
6	P_BSY (N_Port Busy)	Indicates that the responding N_Port is temporarily occupied with other link activity and is not able to accept the frame. A reason code is contained in the Parameter field.	○
7	F_BSY (Fabric Busy)	Indicates that the fabric or the destination N_Port is temporarily occupied with other link activity and the fabric is unable to deliver the frame. A reason code is contained in bits 31-28 of the TYPE field.	○
8	LCR (Link Credit Reset)	Indicates that the N_Port specified by the S_ID requests that the N_Port specified by the D_ID reset any buffers containing Data frames from the S_ID in order to allow the S_ID to reset its end-to-end Credit to its Login value.	○

Note: Support for the ACK_1 is given in the limited case where the PLOGI of the Class 2 is used.

- **Data Frames**

  The Data frames defined include:

  - **FC-4 Device_Data** is a frame which is used by the protocol prescribed by upper levels. (FCP Information Unit, etc.)
  - **FC-4 Video_Data** is not supported by this equipment.
  - **Link_Data** defines link services.

D.1.6 Link Service

Table D.9 Link Service frames supported by the AMS200 (continues on the next page)

No.	Classification	Name	Support	
			Issue	Receive
1	Basic Link Service	ABTS (Abort Sequence)	×	○
2		BA_ACC (Basic_Accept)	○	○
3		BA_RJT (Basic_Reject)	○	○
4		NOP (No Operation)	×	○
5		RMC (Remove Connection)	×	×
6	Extended Link Service	ABTX (Abort_Exchange)	×	×
7		ACC (Accept)	○	○
8		ADVC (Advice Credit)	×	×
9		ECHO (Echo)	×	×
10		ESTC (Estimate Credit)	×	×
11		PLOGI (N_Port Login)	○	○
12		LOGO (Logout)	○	○
13		LS_RJT (Link Service Reject)	○	○
14		FLOGI (Fabric Login)	○	○
15		RCS (Read Connection Status)	×	×
16		RES (Read Exchange Status Block)	×	×
17		RLS (Read Link Status)	×	○
18		RRQ (Reinstate Recovery Qualifier)	×	○
19		RSI (Request Sequence Initiative)	×	×
20		RSS (Read Sequence Status Block)	×	×
21		RTV (Read Time-out Value)	×	×
22		TEST (Test)	×	×
23		SCR (State Change Registration)	○	×
24		RSCN (Registered Status Change Notification)	○	○
25		FAN	×	○

Table D.9 Link Service frames supported by the AMS200 (continued)

No.	Classification	Name	Support	
			Issue	Receive
26	Extended Link Service- Proc.	PRLI (Process Login)	×	○
27		PRLO (Process Logout)	○	○
28		SCN (State Change Notification)	×	×
29		TPLS (Test Process Login State)	×	×
30	Extended Link Service-Alias	GAID (Get Alias_ID)	×	×
31		FACT (Fabric Activate Alias_ID)	×	×
32		FDACT (Fabric Deactivate Alias_ID)	×	×
33		NACT (N_Port Activate Alias_ID)	×	×
34		NDACT (N_Port Deactivate Alias_ID)	×	×
35	Extended Link Service-Class 4	QoSR (Quality of Service Request)	×	×
36		RVCS (Read Virtual Circuit Status)	×	×
37	Extended Link Service - FC-AL	PDISC (Discover N_Port Service Parm)	×	○
38		FDISC (Discover F_Port Service Parm)	×	×
39		ADISC (Discover Address)	×	○
40		TPRLO (Third Party Process Logout)	×	○

D.1.7 FCP

- **Frame Format**

  AMS200 supports the six Information Units (IU) shown in the following table.

Table D.10 Information Unit

No.	Name	Meaning	Support
1	FCP_CMND	Transfers SCSI Command or Task Management	○
2	FCP_XFER_READY	Notifies FCP_DATA will be transferred.	○
3	FCP_DATA	Transfers Data.	○
4	FCP_RSP	Transfers Status Information	○
5	FCP_CMND+FCP_DATA	Transfers SCSI Command and the first Data within a single Information Unit. (Write Type Command)	×
6	FCP_DATA+FCP_RSP	Transfers last Data and the Status Information within a single Information Unit. (Read Type Command)	×

The format of the standard frame header used in the FCP is shown in Table D.11.

Table D.11 Frame Header Format

Bits/Word	31 to 24	23 to 16	15 to 08	07 to 00
0	R_CTL	D_ID		
1	Reserved	S_ID		
2	TYPE	F_CTL		
3	SEQ_ID	DF_CTL	SEQ_CNT	
4	OX_ID		RX_ID	
5	RLTV_OFF			

R_CTL (Routing control):
This is used to identify the information category of the FCP frame.

1: FCP_DATA (Data In action, Data Out action).

5: FCP_XFER_RDY (Data delivery request).

6: FCP_CMND (Command/Task Management Request).

7: FCP_RSP (Command/Task Management Response).

D_ID (Destination ID):
This indicates the transmission destination of a frame. D_ID of the frame from the SCSI command issuer side (Exchange originator) is the target ID of SCSI-3.

S_ID:
This indicates the transmission destination of a frame. S_ID of the frame from the SCSI command issuer side (Exchange originator) is the initiator ID of SCSI-3.

TYPE (Data structure type):
In the TYPE field of all frames of the FCP sequence, 0x08 is set.

F_CTL (Frame control):
This consists of fields for controlling start of the sequence and exchange, and normal and abnormal terminations. For further details, refer to the FC-PH standard.

SEQ_ID (Sequence ID):
This indicates an order of the frames in the sequence. For further details, refer to the FC-PH standard.

DF_CTL (Data field control):
This indicates whether there is an optional header or not. The FCP requires no optional header.

OX_ID (Originator exchange ID):
This indicates the exchange ID on the starting side of the exchange (initiator) and corresponds to the tag number of SCSI-3. (OxFFFF cannot be specified.)

RX_ID (Responder exchange ID):
This indicates the exchange ID on the responding side of the exchange (target).
Any value may be given to this. The responding side of the exchange can assign a unique value to OX_ID (tag).

RLTV_OFF (Relative offset):
In the FCP-DATA IU, the offset (offset on the buffer allocated by the host) of the top byte of the payload of each frame is set. In other IU frames, 0 is set.

- **FCP_CMND**

  The FCP_CMND is sent from a host and is used for the task management instruction such as SCSI command issue and target reset. The payload of FCP_CMND is shown in Table D.1.12.

Table D.12 FCP_CMND Payload

Field Name	Definition	Size
FCP_LUN	Logical Unit Number	8 bytes
FCP_CNTL	byte 0: Reserved	4 bytes
	byte 1: Task Codes bit 7 to 3: Reserved bit 2 to 0: Task Attribute 000: SIMPLE_Q 001: HEAD_OF_Q 001: ORDERED_Q 100: ACA_Q (Not Supported) 101: UNTAGGED	
	byte 2: Task Management Flags bit 7: TERMINATE TASK (Not Supported) bit 6: CLEAR ACA bit 5: TARGET RESET bit 4 to 3: Reserved bit 2: CLEAR TASK SET bit 1: ABORT TASK SET bit 0: Reserved	
	byte 3: Execution Management Codes bit 7 to 2: Reserved bit 1: READ DATA bit 0: WRITE DATA	
FCP_CDB	SCSI Command Descriptor Block	16 bytes
FCP_DL	Data Length	4 bytes

FCP_LUN:
The FCP_LUN field specifies the Logical Unit Number in which the issued SCSI Command is executed.
The Table D.1.13 shows the format of the FCP_LUN field.

Table D.13 FCP_LUN Format

Byte	0	1	2	3	4	5	6	7
Logical unit number	0x00	LUN (Max.256)	0x00	0x00	0x00	0x00	0x00	0x00

FCP_CNTL:
The FCP_CNTL field contains the following control information.

Task Codes:
One of the following task attributes can be specified:

SIMPLE_QUEUE:
The SIMPLE_QUEUE attribute is specified when the task can be executed with the order that the array controller determines.

HEAD_OF_QUEUE:
The HEAD_OF_QUEUE attribute is specified when the task should be executed with the highest priority.

ORDERED_QUEUE:
The HEAD_OF_QUEUE attribute is specified when the task should be executed with the order of the task is issued.

ACA_QUEUE:
This attribute is not supported by the AMS200.

UNTAGGED:
This attribute shows that a command has no tag.

Task Management Flags:
One of the following Task Management Flags can be specified:

TERMINATE TASK:
This Task Management Flag is not supported by the AMS200.

CLEAR ACA:
Suspend the action of all the commands which is being executed with the Logical Unit from the host, or which is queuing, and then respond to ACA ACTIVE status. Also, release the Logical Unit from the ACA status.

TARGET RESET:
The TARGET RESET is used to clear all tasks in the AMS200.
(Same as the SCSI-2 Bus Device Reset message)

CLEAR TASK SET:
The CLEAR TASK SET is used to clear all tasks in the specified Logical Unit.
(Same as the SCSI-2 Clear Queue message)

ABORT TASK SET:
The ABORT TASK SET is used to clear all tasks in the specified Logical Unit for the Initiator. (Same as the SCSI-2 Abort message)
The ABORT TASK (Same as the SCSI-2 Abort Tag message) is specified by the ABTS Link Service.

Execution Management:
The direction of the SCSI data transfer is specified in the Execution Management. The direction depends on the SCSI Command.

- **FCP_CDB**

  The SCSI CDB (Command Descriptor Block) is contained in the FCP_CDB field.
  The Command Link is not supported by the array controller. The Link bit shall be set to 0. When one of these bits is set to 1, the array controller terminates the command with a CHECK ONDITION status (Sense Key = ILLEGAL REQUEST).

- **FCP_DL**

  The total length bytes of the SCSI data is set in the FCP_DL field. Data described with the number of bytes according to the data length set in the FCP_CDB is transferred irrespective of the value set in this field. The value in this field is checked when the status is sent, and the check result is reflected on the FCP_RSP.

D.1.8 FC-4 Device Data Frame/Name Server Request Commands

Table D.14 displays the FC-4 Device Data Frame/Name Server Request commands that the subsystem supports.

Table D.14 FC-4 Device Data Frame

No.	Name
1	FS_ACC
2	FS_RJT
3	RFT_ID (Register FC-4 TYPE)
4	RCS_ID (Register Class of Service)
5	RPT_ID (Register Port TYPE)
6	GPN_ID (Get Port Name)

D.1.9 Initialization Process

- **Link Initialization**

  When the array unit is turned on and becomes ready, the AMS200 performs the Link Initialization process. The LR, LRR, NOS, OLS, and IDLE are exchanged between subsystem and the connected N_Port, and frames cannot be transmitted until the Active state.

  The details of the Link Initialization process is shown in the Table D.15.
  At the beginning, the AMS200 becomes OLS Transmit state, and the Link Initialization process continues until the Active state.

Table D.15 Link Initialization Process

Current State	Input and Next State					
	LR	LRR	NOS	OLS	IDLE	Los of Sync, Timeout
(OLS Transmit) Transmits OLS for min. 5 ms	(LR Receive)	State is not changed	(NOS Receive)	(OLS Receive)	State is not changed	(Wait for OLS)
(LR Receive) Transmits LRR	State is not changed	(LRR Receive)	(NOS Receive)	(OLS Receive)	(Active)	(NOS Transmit)
(OLS Receive) Transmits LR	(LR Receive)	(LRR Receive)	(NOS Receive)	State is not changed	State is not changed	(Wait for OLS)
(LRR Receive) Transmits IDLE	(LR Receive)	State is not changed	(NOS Receive)	(OLS Receive)	(Active)	(NOS Transmit)
(NOS Receive) Transmits OLS	(LR Receive)	State is not changed	State is not changed	(OLS Receive)	State is not changed	(NOS Transmit)
(Wait for OLS) Transmits NOS	(NOS Transmit)	(NOS Transmit)	(NOS Receive)	(OLS Receive)	State is not changed	State is not changed
(NOS Transmit) Transmits NOS	State is not changed	State is not changed	(NOS Receive)	(OLS Receive)	State is not changed	(NOS Transmit)
(Active)	(LR Receive)	(LRR Receive)	(NOS Receive)	(OLS Receive)	State is not changed	State is not changed

- **Loop Initialization**

  When the array unit is turned on and becomes ready and the Arbitrated Loop is detected, the AMS200 performs the Loop Initialization process.
  The Loop Initialization is performed by ARBx (Arbitrate), LIP (Loop Initialization), CLS (Close), and the following Loop Initialization frames:

  LISM: Select Master based on 8-byte Port_Name.

  LIFA: Fabric Assign AL_PA bit map.

  LIPA: Previously Acquired AL_PA bit map.

  LIHA: Hard Assigned AL_PA bit map.

  LISA: Soft Assigned AL_PA bit map.

  LIRP: Report AL_PA position map.

LILP: Loop AL_PA position map.

The AMS200 transmits LIP first. When LIP is detected by the AMS200, the array controller transmits LISM. When the same LISM as the AMS200 has transmitted is received at the array controller, the subsystem becomes a Loop Master, and the subsystem transmits and receives ARBx, LIFA, LIPA, LIHA, LISA, LIRP, and LILP with address map, and determines the AL_PA of each L_Port. At the end of the Loop Initialization, the subsystem transmits and receives CLS.

When the AMS200 does not become a Loop Master, the transmission of LIFA, LIHA, LISA, LIRP, and LILP are initiated by the Loop Master. The AMS200 receives bit map information, and may add own AL_PA, and transmits it to the next L_Port. At the end of the Loop Initialization, the subsystem receives and transmits CLS.

D.1.10 Fibre Channel Sequence Example

- **FCP Information Unit**

  Sending all data with one FCP_DATA:

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_XFER_READY
	<----------	FCP_DATA
	<----------	FCP_RSP

  Sending all data dividing them into two or more FCP_DATAs:

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_XFER_READY
	<----------	FCP_DATA
	<----------	FCP_XFER_READY
	<----------	FCP_DATA
	<----------	FCP_XFER_READY
	<----------	FCP_DATA
	<----------	FCP_RSP

At the time of the Read Xfer Ready Disabled:

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_XFER_DATA
	<----------	FCP_XFER_DATA
	<----------	FCP_RSP

The FCP_XFER_RDY is not sent before sending the FCP_XFER_DATA.

Write Commands

Sending all data with the one FCP_DATA:

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_XFER_READY
FCP_DATA	---------->	
	<----------	FCP_RSP

Sending all data with the two or more FCP_DATAs:

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_XFER_READY
FCP_DATA	---------->	
	<----------	FCP_XFER_READY
FCP_DATA	---------->	
	<----------	FCP_XFER_READY
FCP_DATA	---------->	
	<----------	FCP_RSP

At the time of the Xfer Ready Disabled (not supported):

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
FCP_DATA	---------->	
	<----------	FCP_XFER_READY
FCP_DATA	---------->	
	<----------	FCP_XFER_READY
FCP_DATA	---------->	
	<----------	FCP_RSP

The FCP_XFER_RDY is not sent before sending the first FCP_DATA.

Control Commands

With no data transfer:

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_RSP

Queue Full, Busy, and Check Condition (before data transfer):

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_RSP

Status such as the Queue Full and Busy are stored in the FCP_RSP.

Task management FCP_CMND (Target, Reset, Clear Task Set, and Abort Task Set):

Initiator IU	Direction	Target IU
FCP_CMND	---------->	
	<----------	FCP_RSP

- **Link service**

  FLOGI, PLOGI, LOGO, PRLI, and PRLO.
  When the command is accepted normally:

LS_Command	Direction	LS_Command
Host Login (PLOGI)	---------->	
	<----------	Accept (ACC)

When the command is rejected:

LS_Command	Direction	LS_Command
Host Login (PLOGI)	---------->	
	<----------	Link Service Reject (LS_RJT)

- **Loop Initialization**

  When the subsystem becomes the loop master:

<AMS200>	Direction	
LIP, LIP	---------->	
	<----------	LIP, LIP
LISM, LISM(*1)	---------->	
	<----------	LISM, LISM
ARB (F0), ARB (F0)	---------->	
	<----------	ARB (F0), ARB (F0)
LIFA	---------->	
	<----------	LIFA
LIPA	---------->	
	<----------	LIPA
LIHA	---------->	
	<----------	LIHA
LISA	---------->	
	<----------	LISA
LIRP	---------->	
	<----------	LIRP
LILP	---------->	
	<----------	LILP
CLS (Close)	---------->	

Note 1: The subsystem becomes the loop master when it sends the LISM with AL_PA = EF and the same LISM is returned. The AL_PA is decided by the LIFA, LIPA, LIHA, LISA, LIRP, and LILP frames and the initialization is completed by the CLS.

When another loop master exists:

<AMS200>	Direction	
LIP, LIP	---------->	
	<----------	LIP, LIP
LISM, LISM	---------->	
	<----------	LISM, LISM
	<----------	ARB (F0), ARB (F0)
ARB (F0), ARB (F0)	---------->	
	<----------	LIFA
LIFA	---------->	
	<----------	LIPA
LIPA	---------->	
	<----------	LIHA
LIHA	---------->	
	<----------	LISA
LISA	---------->	
	<----------	LIRP
LIRP	---------->	
	<----------	LILP
LILP	---------->	
	<----------	CLS (Close)

- **Fabric Connection**

  Table D.16 displays the basic sequence of the frame at the time of start-up when the subsystem is in the fabric connection.

Table D.16 Link Initialization Process

No	Opponent Party	Frame	Direction	Frame	<AMS200>
1	<Fabric>	FAN	→		Is monitoring the PR_TOV timer
			←	FLOGI	S_IDis issued with: PtoP=0x000000 FC_AL=0x0000AL_PA
		ACC	→		
2	<Name Server>		←	PLOGI	Logs in the name server.
		ACC	→		
3	<Name Server>		←	RCS_ID	Registers the support class.
		FS_ACC	→		
4	<Name Server>		←	RFT_ID	Registers the FC-4 type.
		FS_ACC	→		
5	<Name Server>		←	RPT_ID	Registers the type of own port as the N/NL.
		FS_ACC	→		
6	<Fabric Controller>		←	SCR	Receives and registers the RSCN.
		ACC	→		(=3: Full Registration)
7	<Fabric Controller>		←	RSCN	Requires a host computer for an issue of RSCN again. (ADR format = 0
		ACC	→		Affected N_Port ID = Own port address)

- **Response when receiving the ELS without the PLOGI.**

  Table D.17 displays the response made when receiving the ELS without the PLOGI.

Table D.17 Response When Receiving ELS without PLOGI

Frame Received	Response	
	In FC_AL	In Point-to-Point (fabric) Connection
FCP_CMND	No response (frame is abandoned.)	No response (frame is abandoned.)
PLOGI	Usual operation (Response in normal state: ACC Response when an error occurs: LS_RJT)	Usual operation (Response in normal state: ACC Response when an error occurs: LS_RJT)
FLOGI	Response with ACC (N_Port)	Response with ACC (N_Port)
LOGO	Usual operation (Response in normal state: ACC Response when an error occurs: LS_RJT)	Usual operation (Response in normal state: ACC Response when an error occurs: LS_RJT)
PRLI	Response with LOGO	Response with LOGO
PRLO	Response with LOGO	Response with LOGO
ADISC	Response with LOGO	Response with LOGO
PDISC	Response with LOGO	Response with LOGO
TPRLO	Response with LOGO	Response with LOGO
Other	Response with LOGO	Response with LOGO

The following response is made while the basic sequence (FLOGI to RSCN) of the frame is being executed when the subsystem starts up in the fabric connection:

- When the received frame is the FAN, normal operation is done.
- When the received frame is the PLOGI, ADISC, or PDISC, a response is made with the LS_RJT.
- When the other frame is received, no response is made (the frame is abandoned).

D.2 Ethernet Connection Specifications

D.2.1 System Configuration

To configure this NAS system, use the switches complied with the following standards:

IEEE 802.1D STP
IEEE 802.1w RSTP
IEEE 802.3 CSMA/CD
IEEE 802.3u Fast Ethernet
IEEE 802.3z 1000BaseX
IEEE 802.1Q Virtual LANs
IEEE 802.3ad Dynamic LACP

RFC 768 UDP
RFC 783 TFTP
RFC 791 IP
RFC 793 TCP
RFC 1157 SNMP v1
RFC 1213 MIB II
RFC 1757 RMON
RFC 1901 SNMP v2

- Cable

The following table lists and describes the cable specification for LAN interface and the connector type.

Table D.18 Response When Receiving ELS without PLOGI

Cable Type	Corresponding Transmission Band	Specification	
		Cable	Connector
Category 6	1000BASE-TX	UTP	RJ-45

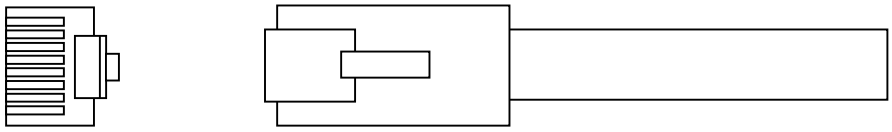


Figure D.4 Connector Type on the Cable Side

- Connector Type on the Subsystem Side

The following figure shows the connector type for the LAN interface on the subsystem side.

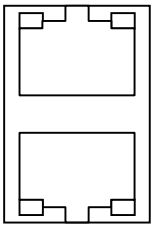


Figure D.5 Connector Type on the Subsystem Side

Appendix E Remote Adapter Specifications

E.1 Remote Adapter Specifications

Table E.1 Remote Adapter Specifications

Model	Item	Remote Adapter (Main Unit) (DF-F700-VR4A)	Remote Adapter (Hub) (DF-F700-VR4H)
Physical Specifications	Chassis size (W×D×H) (mm)	109×190×42	219×190×42
	Mass (kg)	1	2
Input power	Input voltage (V)	AC 100-240	
Specifications	Frequency (Hz)	50/60 ±1	
	Number of phases, cabling	Single-phase with protective grounding	
Steady-state current (A)		0.15	
Environmental specifications	Temperature (°C)	In operation: 10 to 40 In non-operation: -10 to 50 In transport/storage: -30 to 60	
	Humidity (%)	In operation: 8 to 80 In non-operation: 8 to 90 In transport/storage: 5 to 100	
	Vibration (m/s^2)	In operation: 2.5 or less In non-operation: 5.0 or less In transport/storage: 5.0 or less	
Insulation Performance	Insulation withstand voltage	AC1,500 V (10 mA, 1 min)	
	Insulation resistance	DC500 V, 10 M Ω or more	

E.2 Remote Adapter Dimensions

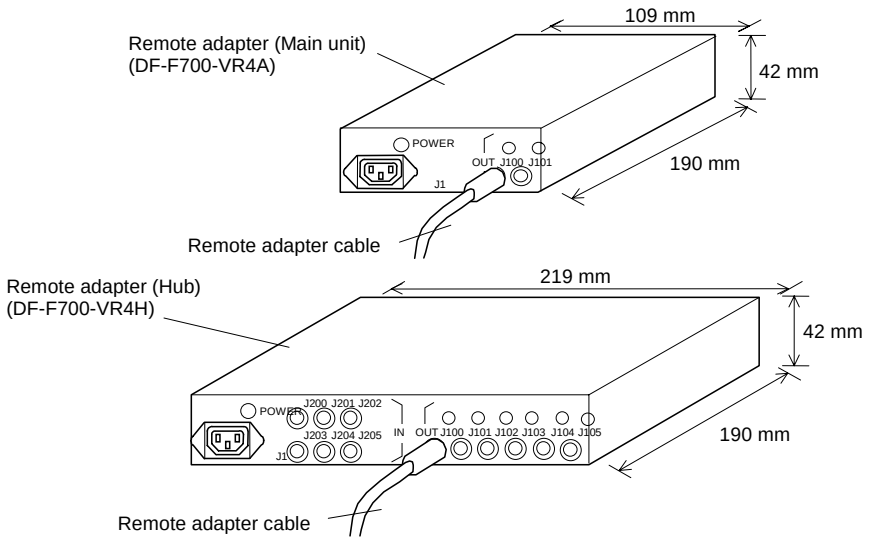


Figure E.1 Information Message Screen

Appendix F List of Storage Capacities Corresponding to RAID Levels and Configurations

The upper and lower values in each cell show the number of mounted disk drives and disk capacity respectively. No spare disk is included.

Note: All values of storage capacities in the following tables are calculated as 1 Gbyte = 1,000,000,000 bytes.

(This definition is different from 1 Kbyte = 1,024 bytes.)

Table F.1 List of Capacities Corresponding to RAID0 (72 Gbytes)

Disk capacity	71.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D	2	14	30	44	60	74	90	104
	142.62	998.35	2139.33	3137.69	4278.67	5277.03	6418.01	7416.37
3D	3	15	30	45	60	75	90	105
	213.93	1069.66	2139.33	3209.00	4278.67	5348.34	6418.01	7487.68
4D	4	12	28	44	60	72	88	104
	285.24	855.73	1996.71	3137.69	4278.67	5134.41	6275.39	7416.37
5D	5	15	30	45	60	75	90	105
	356.55	1069.66	2139.33	3209.00	4278.67	5348.34	6418.01	7487.68
6D	6	12	30	42	60	72	90	102
	427.86	855.73	2139.33	2995.07	4278.67	5134.41	6418.01	7273.74
7D	7	14	28	42	56	70	84	105
	499.17	998.35	1996.71	2995.07	3993.43	4991.78	5990.14	7487.68
8D	8	8	24	40	56	72	88	104
	570.49	570.49	1711.47	2852.45	3993.43	5134.41	6275.39	7416.37
9D	9	9	27	45	54	72	90	99
	641.80	641.80	1925.40	3209.00	3850.80	5134.41	6418.01	7059.81
10D	10	10	30	40	60	70	90	100
	713.11	713.11	2139.33	2852.45	4278.67	4991.78	6418.01	7131.12
11D	11	11	22	44	55	66	88	99
	784.42	784.42	1568.84	3137.69	3922.11	4706.54	6275.39	7059.81
12D	12	12	24	36	60	72	84	96
	855.73	855.73	1711.47	2567.20	4278.67	5134.41	5990.14	6845.88
13D	13	13	26	39	52	65	78	104
	927.04	927.04	1854.09	2781.13	3708.18	4635.23	5562.27	7416.37
14D	14	14	28	42	56	70	84	98
	998.35	998.35	1996.71	2995.07	3993.43	4991.78	5990.14	6988.50
15D	15	15	30	45	60	75	90	105
	1069.66	1069.66	2139.33	3209.00	4278.67	5348.34	6418.01	7487.68
16D	0	0	16	32	48	64	80	96
	0.00	0.00	1140.98	2281.96	3422.94	4563.92	5704.90	6845.88

Table F.2 List of Capacities Corresponding to RAID1 (72 Gbytes)

Disk Capacity	71.3 G bytes							
Component Unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total Range of Disk Drives	Min.	15 (Max)	30	45	60	75	90	105
1D+1D	2	14	30	44	60	74	90	104
	71.31	499.17	1069.66	1568.84	2139.33	2638.51	3209.00	3708.18

Table F.3 List of Capacities Corresponding to RAID5 (72 Gbytes)

Disk capacity	71.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+1P	3	15	30	45	60	75	90	105
	142.62	713.11	1426.22	2139.33	2852.45	3565.56	4278.67	4991.78
3D+1P	4	12	28	44	60	72	88	104
	213.93	641.80	1497.53	2353.27	3209.00	3850.80	4706.54	5562.27
4D+1P	5	15	30	45	60	75	90	105
	285.24	855.73	1711.47	2567.20	3422.94	4278.67	5134.41	5990.14
5D+1P	6	12	30	42	60	72	90	102
	356.55	713.11	1782.78	2495.89	3565.56	4278.67	5348.34	6061.45
6D+1P	7	14	28	42	56	70	84	105
	427.86	855.73	1711.47	2567.20	3422.94	4278.67	5134.41	6418.01
7D+1P	8	8	24	40	56	72	88	104
	499.17	499.17	1497.53	2495.89	3494.25	4492.60	5490.96	6489.32
8D+1P	9	9	27	45	54	72	90	99
	570.49	570.49	1711.47	2852.45	3422.94	4563.92	5704.90	6275.39
9D+1P	10	10	30	40	60	70	90	100
	641.80	641.80	1925.40	2567.20	3850.80	4492.60	5776.21	6418.01
10D+1P	11	11	22	44	55	66	88	99
	713.11	713.11	1426.22	2852.45	3565.56	4278.67	5704.90	6418.01
11D+1P	12	12	24	36	60	72	84	96
	784.42	784.42	1568.84	2353.27	3922.11	4706.54	5490.96	6275.39
12D+1P	13	13	26	39	52	65	78	104
	855.73	855.73	1711.47	2567.20	3422.94	4278.67	5134.41	6845.88
13D+1P	14	14	28	42	56	70	84	98
	927.04	927.04	1854.09	2781.13	3708.18	4635.23	5562.27	6489.32
14D+1P	15	15	30	45	60	75	90	105
	998.35	998.35	1996.71	2995.07	3993.43	4991.78	5990.14	6988.50
15D+1P	0	0	16	32	48	64	80	96
	0.00	0.00	1069.66	2139.33	3209.00	4278.67	5348.34	6418.01

Table F.4 List of Capacities Corresponding to RAID6 (72 Gbytes)

Disk capacity	71.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+2P	4	12	28	44	60	72	88	104
	142.62	427.86	998.35	1568.84	2139.33	2567.20	3137.69	3708.18
3D+2P	5	15	30	45	60	75	90	105
	213.93	641.80	1283.60	1925.40	2567.20	3209.00	3850.80	4492.60
4D+2P	6	12	30	42	60	72	90	102
	285.24	570.49	1426.22	1996.71	2852.45	3422.94	4278.67	4849.16
5D+2P	7	14	28	42	56	70	84	105
	356.55	713.11	1426.22	2139.33	2852.45	3565.56	4278.67	5348.34
6D+2P	8	8	24	40	56	72	88	104
	427.86	427.86	1283.60	2139.33	2995.07	3850.80	4706.54	5562.27
7D+2P	9	9	27	45	54	72	90	99
	499.17	499.17	1497.53	2495.89	2995.07	3993.43	4991.78	5490.96
8D+2P	10	10	30	40	60	70	90	100
	570.49	570.49	1711.47	2281.96	3422.94	3993.43	5134.41	5704.90
9D+2P	11	11	22	44	55	66	88	99
	641.80	641.80	1283.60	2567.20	3209.00	3850.80	5134.41	5776.21
10D+2P	12	12	24	36	60	72	84	96
	713.11	713.11	1426.22	2139.33	3565.56	4278.67	4991.78	5704.90
11D+2P	13	13	26	39	52	65	78	104
	784.42	784.42	1568.84	2353.27	3137.69	3922.11	4706.54	6275.39
12D+2P	14	14	28	42	56	70	84	98
	855.73	855.73	1711.47	2567.20	3422.94	4278.67	5134.41	5990.14
13D+2P	15	15	30	45	60	75	90	105
	927.04	927.04	1854.09	2781.13	3708.18	4635.23	5562.27	6489.32
14D+2P	0	0	16	32	48	64	80	96
	0.00	0.00	998.35	1996.71	2995.07	3993.43	4991.78	5990.14
15D+2P	0	0	17	34	51	68	85	102
	0.00	0.00	1069.66	2139.33	3209.00	4278.67	5348.34	6418.01
16D+2P	0	0	18	36	54	72	90	90
	0.00	0.00	1140.98	2281.96	3422.94	4563.92	5704.90	5704.90
17D+2P	0	0	19	38	57	57	76	95
	0.00	0.00	1212.29	2424.58	3636.87	3636.87	4849.16	6061.45
18D+2P	0	0	20	40	60	60	80	100
	0.00	0.00	1283.60	2567.20	3850.80	3850.80	5134.41	6418.01
19D+2P	0	0	21	42	42	63	84	105
	0.00	0.00	1354.91	2709.82	2709.82	4064.74	5419.65	6774.56
20D+2P	0	0	22	44	44	66	88	88
	0.00	0.00	1426.22	2852.45	2852.45	4278.67	5704.90	5704.90
21D+2P	0	0	23	23	46	69	69	92
	0.00	0.00	1497.53	1497.53	2995.07	4492.60	4492.60	5990.14
22D+2P	0	0	24	24	48	72	72	96
	0.00	0.00	1568.84	1568.84	3137.69	4706.54	4706.54	6275.39
23D+2P	0	0	25	25	50	75	75	100
	0.00	0.00	1640.15	1640.15	3280.31	4920.47	4920.47	6560.63
24D+2P	0	0	26	26	52	52	78	104
	0.00	0.00	1711.47	1711.47	3422.94	3422.94	5134.41	6845.88
25D+2P	0	0	27	27	54	54	81	81
	0.00	0.00	1782.78	1782.78	3565.56	3565.56	5348.34	5348.34
26D+2P	0	0	28	28	56	56	84	84
	0.00	0.00	1854.09	1854.09	3708.18	3708.18	5562.27	5562.27

Table F.4 List of Capacities Corresponding to RAID6 (72 Gbytes) (continued)

Disk capacity	71.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
27D+2P	0	0	29	29	58	58	87	87
	0.00	0.00	1925.40	1925.40	3850.80	3850.80	5776.21	5776.21
28D+2P	0	0	30	30	60	60	90	90
	0.00	0.00	1996.71	1996.71	3993.43	3993.43	5990.14	5990.14

Table F.5 List of Capacities Corresponding to RAID1+0 (72 Gbytes)

Disk capacity	71.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+2D	4	12	28	44	60	72	88	104
	142.62	427.86	998.35	1568.84	2139.33	2567.20	3137.69	3708.18
3D+3D	6	12	30	42	60	72	90	102
	213.93	427.86	1069.66	1497.53	2139.33	2567.20	3209.00	3636.87
4D+4D	8	8	24	40	56	72	88	104
	285.24	285.24	855.73	1426.22	1996.71	2567.20	3137.69	3708.18
5D+5D	10	10	30	40	60	70	90	100
	356.55	356.55	1069.66	1426.22	2139.33	2495.89	3209.00	3565.56
6D+6D	12	12	24	36	60	72	84	96
	427.86	427.86	855.73	1283.60	2139.33	2567.20	2995.07	3422.94
7D+7D	14	14	28	42	56	70	84	98
	499.17	499.17	998.35	1497.53	1996.71	2495.89	2995.07	3494.25
8D+8D	0	0	16	32	48	64	80	96
	0.00	0.00	570.49	1140.98	1711.47	2281.96	2852.45	3422.94

Table F.6 List of Capacities Corresponding to RAID0 (146 Gbytes)

Disk capacity	143.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D	2	14	30	44	60	74	90	104
	286.61	2006.29	4299.19	6305.49	8598.39	10604.69	12897.59	14903.88
3D	3	15	30	45	60	75	90	105
	429.91	2149.59	4299.19	6448.79	8598.39	10747.99	12897.59	15047.19
4D	4	12	28	44	60	72	88	104
	573.22	1719.67	4012.58	6305.49	8598.39	10318.07	12610.98	14903.88
5D	5	15	30	45	60	75	90	105
	716.53	2149.59	4299.19	6448.79	8598.39	10747.99	12897.59	15047.19
6D	6	12	30	42	60	72	90	102
	859.83	1719.67	4299.19	6018.87	8598.39	10318.07	12897.59	14617.27
7D	7	14	28	42	56	70	84	105
	1003.14	2006.29	4012.58	6018.87	8025.17	10031.46	12037.75	15047.19
8D	8	8	24	40	56	72	88	104
	1146.45	1146.45	3439.35	5732.26	8025.17	10318.07	12610.98	14903.88
9D	9	9	27	45	54	72	90	99
	1289.75	1289.75	3869.27	6448.79	7738.55	10318.07	12897.59	14187.35
10D	10	10	30	40	60	70	90	100
	1433.06	1433.06	4299.19	5732.26	8598.39	10031.46	12897.59	14330.66
11D	11	11	22	44	55	66	88	99
	1576.37	1576.37	3152.74	6305.49	7881.86	9458.23	12610.98	14187.35
12D	12	12	24	36	60	72	84	96
	1719.67	1719.67	3439.35	5159.03	8598.39	10318.07	12037.75	13757.43
13D	13	13	26	39	52	65	78	104
	1862.98	1862.98	3725.97	5588.95	7451.94	9314.93	11177.91	14903.88
14D	14	14	28	42	56	70	84	98
	2006.29	2006.29	4012.58	6018.87	8025.17	10031.46	12037.75	14044.04
15D	15	15	30	45	60	75	90	105
	2149.59	2149.59	4299.19	6448.79	8598.39	10747.99	12897.59	15047.19
16D	0	0	16	32	48	64	80	96
	0.00	0.00	2292.90	4585.81	6878.71	9171.62	11464.53	13757.43

Table F.7 List of Capacities Corresponding to RAID1 (146 Gbytes)

Disk Capacity	143.3 G bytes							
Component Unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total Range of Disk Drives	Min.	15 (Max)	30	45	60	75	90	105
1D+1D	2	14	30	44	60	74	90	104
	143.30	1003.14	2149.59	3152.74	4299.19	5302.34	6448.79	7451.94

Table F.8 List of Capacities Corresponding to RAID5 (146 Gbytes)

Disk capacity	143.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+1P	3	15	30	45	60	75	90	105
	286.61	1433.06	2866.13	4299.19	5732.26	7165.33	8598.39	10031.46
3D+1P	4	12	28	44	60	72	88	104
	429.91	1289.75	3009.43	4729.11	6448.79	7738.55	9458.23	11177.91
4D+1P	5	15	30	45	60	75	90	105
	573.22	1719.67	3439.35	5159.03	6878.71	8598.39	10318.07	12037.75
5D+1P	6	12	30	42	60	72	90	102
	716.53	1433.06	3582.66	5015.73	7165.33	8598.39	10747.99	12181.06
6D+1P	7	14	28	42	56	70	84	105
	859.83	1719.67	3439.35	5159.03	6878.71	8598.39	10318.07	12897.59
7D+1P	8	8	24	40	56	72	88	104
	1003.14	1003.14	3009.43	5015.73	7022.02	9028.31	11034.61	13040.90
8D+1P	9	9	27	45	54	72	90	99
	1146.45	1146.45	3439.35	5732.26	6878.71	9171.62	11464.53	12610.98
9D+1P	10	10	30	40	60	70	90	100
	1289.75	1289.75	3869.27	5159.03	7738.55	9028.31	11607.83	12897.59
10D+1P	11	11	22	44	55	66	88	99
	1433.06	1433.06	2866.13	5732.26	7165.33	8598.39	11464.53	12897.59
11D+1P	12	12	24	36	60	72	84	96
	1576.37	1576.37	3152.74	4729.11	7881.86	9458.23	11034.61	12610.98
12D+1P	13	13	26	39	52	65	78	104
	1719.67	1719.67	3439.35	5159.03	6878.71	8598.39	10318.07	13757.43
13D+1P	14	14	28	42	56	70	84	98
	1862.98	1862.98	3725.97	5588.95	7451.94	9314.93	11177.91	13040.90
14D+1P	15	15	30	45	60	75	90	105
	2006.29	2006.29	4012.58	6018.87	8025.17	10031.46	12037.75	14044.04
15D+1P	0	0	16	32	48	64	80	96
	0.00	0.00	2149.59	4299.19	6448.79	8598.39	10747.99	12897.59

Table F.9 List of Capacities Corresponding to RAID6 (146 Gbytes)

Disk capacity	143.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+2P	4	12	28	44	60	72	88	104
	286.61	859.83	2006.29	3152.74	4299.19	5159.03	6305.49	7451.94
3D+2P	5	15	30	45	60	75	90	105
	429.91	1289.75	2579.51	3869.27	5159.03	6448.79	7738.55	9028.31
4D+2P	6	12	30	42	60	72	90	102
	573.22	1146.45	2866.13	4012.58	5732.26	6878.71	8598.39	9744.85
5D+2P	7	14	28	42	56	70	84	105
	716.53	1433.06	2866.13	4299.19	5732.26	7165.33	8598.39	10747.99
6D+2P	8	8	24	40	56	72	88	104
	859.83	859.83	2579.51	4299.19	6018.87	7738.55	9458.23	11177.91
7D+2P	9	9	27	45	54	72	90	99
	1003.14	1003.14	3009.43	5015.73	6018.87	8025.17	10031.46	11034.61
8D+2P	10	10	30	40	60	70	90	100
	1146.45	1146.45	3439.35	4585.81	6878.71	8025.17	10318.07	11464.53
9D+2P	11	11	22	44	55	66	88	99
	1289.75	1289.75	2579.51	5159.03	6448.79	7738.55	10318.07	11607.83
10D+2P	12	12	24	36	60	72	84	96
	1433.06	1433.06	2866.13	4299.19	7165.33	8598.39	10031.46	11464.53
11D+2P	13	13	26	39	52	65	78	104
	1576.37	1576.37	3152.74	4729.11	6305.49	7881.86	9458.23	12610.98
12D+2P	14	14	28	42	56	70	84	98
	1719.67	1719.67	3439.35	5159.03	6878.71	8598.39	10318.07	12037.75
13D+2P	15	15	30	45	60	75	90	105
	1862.98	1862.98	3725.97	5588.95	7451.94	9314.93	11177.91	13040.90
14D+2P	0	0	16	32	48	64	80	96
	0.00	0.00	2006.29	4012.58	6018.87	8025.17	10031.46	12037.75
15D+2P	0	0	17	34	51	68	85	102
	0.00	0.00	2149.59	4299.19	6448.79	8598.39	10747.99	12897.59
16D+2P	0	0	18	36	54	72	90	90
	0.00	0.00	2292.90	4585.81	6878.71	9171.62	11464.53	11464.53
17D+2P	0	0	19	38	57	57	76	95
	0.00	0.00	2436.21	4872.42	7308.63	7308.63	9744.85	12181.06
18D+2P	0	0	20	40	60	60	80	100
	0.00	0.00	2579.51	5159.03	7738.55	7738.55	10318.07	12897.59
19D+2P	0	0	21	42	42	63	84	105
	0.00	0.00	2722.82	5445.65	5445.65	8168.47	10891.30	13614.12
20D+2P	0	0	22	44	44	66	88	88
	0.00	0.00	2866.13	5732.26	5732.26	8598.39	11464.53	11464.53
21D+2P	0	0	23	23	46	69	69	92
	0.00	0.00	3009.43	3009.43	6018.87	9028.31	9028.31	12037.75
22D+2P	0	0	24	24	48	72	72	96
	0.00	0.00	3152.74	3152.74	6305.49	9458.23	9458.23	12610.98
23D+2P	0	0	25	25	50	75	75	100
	0.00	0.00	3296.05	3296.05	6592.10	9888.15	9888.15	13184.20
24D+2P	0	0	26	26	52	52	78	104
	0.00	0.00	3439.35	3439.35	6878.71	6878.71	10318.07	13757.43
25D+2P	0	0	27	27	54	54	81	81
	0.00	0.00	3582.66	3582.66	7165.33	7165.33	10747.99	10747.99
26D+2P	0	0	28	28	56	56	84	84
	0.00	0.00	3725.97	3725.97	7451.94	7451.94	11177.91	11177.91

Table F.9 List of Capacities Corresponding to RAID6 (146 Gbytes) (continued)

Disk capacity	143.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
27D+2P	0	0	29	29	58	58	87	87
	0.00	0.00	3869.27	3869.27	7738.55	7738.55	11607.83	11607.83
28D+2P	0	0	30	30	60	60	90	90
	0.00	0.00	4012.58	4012.58	8025.17	8025.17	12037.75	12037.75

Table F.10 List of Capacities Corresponding to RAID1+0 (146 Gbytes)

Disk capacity	143.3 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+2D	4	12	28	44	60	72	88	104
	286.61	859.83	2006.29	3152.74	4299.19	5159.03	6305.49	7451.94
3D+3D	6	12	30	42	60	72	90	102
	429.91	859.83	2149.59	3009.43	4299.19	5159.03	6448.79	7308.63
4D+4D	8	8	24	40	56	72	88	104
	573.22	573.22	1719.67	2866.13	4012.58	5159.03	6305.49	7451.94
5D+5D	10	10	30	40	60	70	90	100
	716.53	716.53	2149.59	2866.13	4299.19	5015.73	6448.79	7165.33
6D+6D	12	12	24	36	60	72	84	96
	859.83	859.83	1719.67	2579.51	4299.19	5159.03	6018.87	6878.71
7D+7D	14	14	28	42	56	70	84	98
	1003.14	1003.14	2006.29	3009.43	4012.58	5015.73	6018.87	7022.02
8D+8D	0	0	16	32	48	64	80	96
	0.00	0.00	1146.45	2292.90	3439.35	4585.81	5732.26	6878.71

Table F.11 List of Capacities Corresponding to RAID0 (300 Gbytes)

Disk capacity	287.6 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D	2	14	30	44	60	74	90	104
	575.25	4026.80	8628.85	12655.65	17257.71	21284.51	25886.57	29913.37
3D	3	15	30	45	60	75	90	105
	862.88	4314.42	8628.85	12943.28	17257.71	21572.14	25886.57	30201.00
4D	4	12	28	44	60	72	88	104
	1150.51	3451.54	8053.60	12655.65	17257.71	20709.25	25311.31	29913.37
5D	5	15	30	45	60	75	90	105
	1438.14	4314.42	8628.85	12943.28	17257.71	21572.14	25886.57	30201.00
6D	6	12	30	42	60	72	90	102
	1725.77	3451.54	8628.85	12080.40	17257.71	20709.25	25886.57	29338.11
7D	7	14	28	42	56	70	84	105
	2013.40	4026.80	8053.60	12080.40	16107.20	20134.00	24160.80	30201.00
8D	8	8	24	40	56	72	88	104
	2301.02	2301.02	6903.08	11505.14	16107.20	20709.25	25311.31	29913.37
9D	9	9	27	45	54	72	90	99
	2588.65	2588.65	7765.97	12943.28	15531.94	20709.25	25886.57	28475.23
10D	10	10	30	40	60	70	90	100
	2876.28	2876.28	8628.85	11505.14	17257.71	20134.00	25886.57	28762.85
11D	11	11	22	44	55	66	88	99
	3163.91	3163.91	6327.82	12655.65	15819.57	18983.48	25311.31	28475.23
12D	12	12	24	36	60	72	84	96
	3451.54	3451.54	6903.08	10354.62	17257.71	20709.25	24160.80	27612.34
13D	13	13	26	39	52	65	78	104
	3739.17	3739.17	7478.34	11217.51	14956.68	18695.85	22435.03	29913.37
14D	14	14	28	42	56	70	84	98
	4026.80	4026.80	8053.60	12080.40	16107.20	20134.00	24160.80	28187.60
15D	15	15	30	45	60	75	90	105
	4314.42	4314.42	8628.85	12943.28	17257.71	21572.14	25886.57	30201.00
16D	0	0	16	32	48	64	80	96
	0.00	0.00	4602.05	9204.11	13806.17	18408.22	23010.28	27612.34

Table F.12 List of Capacities Corresponding to RAID1 (300 Gbytes)

Disk Capacity	287.6 G bytes							
Component Unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total Range of Disk Drives	Min.	15 (Max)	30	45	60	75	90	105
1D+1D	2	14	30	44	60	74	90	104
	287.62	2013.40	4314.42	6327.82	8628.85	10642.25	12943.28	14956.68

Table F.13 List of Capacities Corresponding to RAID5 (300 Gbytes)

Disk capacity	287.6 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+1P	3	15	30	45	60	75	90	105
	575.25	2876.28	5752.57	8628.85	11505.14	14381.42	17257.71	20134.00
3D+1P	4	12	28	44	60	72	88	104
	862.88	2588.65	6040.20	9491.74	12943.28	15531.94	18983.48	22435.03
4D+1P	5	15	30	45	60	75	90	105
	1150.51	3451.54	6903.08	10354.62	13806.17	17257.71	20709.25	24160.80
5D+1P	6	12	30	42	60	72	90	102
	1438.14	2876.28	7190.71	10067.00	14381.42	17257.71	21572.14	24448.43
6D+1P	7	14	28	42	56	70	84	105
	1725.77	3451.54	6903.08	10354.62	13806.17	17257.71	20709.25	25886.57
7D+1P	8	8	24	40	56	72	88	104
	2013.40	2013.40	6040.20	10067.00	14093.80	18120.60	22147.40	26174.20
8D+1P	9	9	27	45	54	72	90	99
	2301.02	2301.02	6903.08	11505.14	13806.17	18408.22	23010.28	25311.31
9D+1P	10	10	30	40	60	70	90	100
	2588.65	2588.65	7765.97	10354.62	15531.94	18120.60	23297.91	25886.57
10D+1P	11	11	22	44	55	66	88	99
	2876.28	2876.28	5752.57	11505.14	14381.42	17257.71	23010.28	25886.57
11D+1P	12	12	24	36	60	72	84	96
	3163.91	3163.91	6327.82	9491.74	15819.57	18983.48	22147.40	25311.31
12D+1P	13	13	26	39	52	65	78	104
	3451.54	3451.54	6903.08	10354.62	13806.17	17257.71	20709.25	27612.34
13D+1P	14	14	28	42	56	70	84	98
	3739.17	3739.17	7478.34	11217.51	14956.68	18695.85	22435.03	26174.20
14D+1P	15	15	30	45	60	75	90	105
	4026.80	4026.80	8053.60	12080.40	16107.20	20134.00	24160.80	28187.60
15D+1P	0	0	16	32	48	64	80	96
	0.00	0.00	4314.42	8628.85	12943.28	17257.71	21572.14	25886.57

Table F.14 List of Capacities Corresponding to RAID6 (300 Gbytes)

Disk capacity	287.6 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+2P	4	12	28	44	60	72	88	104
	575.25	1725.77	4026.80	6327.82	8628.85	10354.62	12655.65	14956.68
3D+2P	5	15	30	45	60	75	90	105
	862.88	2588.65	5177.31	7765.97	10354.62	12943.28	15531.94	18120.60
4D+2P	6	12	30	42	60	72	90	102
	1150.51	2301.02	5752.57	8053.60	11505.14	13806.17	17257.71	19558.74
5D+2P	7	14	28	42	56	70	84	105
	1438.14	2876.28	5752.57	8628.85	11505.14	14381.42	17257.71	21572.14
6D+2P	8	8	24	40	56	72	88	104
	1725.77	1725.77	5177.31	8628.85	12080.40	15531.94	18983.48	22435.03
7D+2P	9	9	27	45	54	72	90	99
	2013.40	2013.40	6040.20	10067.00	12080.40	16107.20	20134.00	22147.40
8D+2P	10	10	30	40	60	70	90	100
	2301.02	2301.02	6903.08	9204.11	13806.17	16107.20	20709.25	23010.28
9D+2P	11	11	22	44	55	66	88	99
	2588.65	2588.65	5177.31	10354.62	12943.28	15531.94	20709.25	23297.91
10D+2P	12	12	24	36	60	72	84	96
	2876.28	2876.28	5752.57	8628.85	14381.42	17257.71	20134.00	23010.28
11D+2P	13	13	26	39	52	65	78	104
	3163.91	3163.91	6327.82	9491.74	12655.65	15819.57	18983.48	25311.31
12D+2P	14	14	28	42	56	70	84	98
	3451.54	3451.54	6903.08	10354.62	13806.17	17257.71	20709.25	24160.80
13D+2P	15	15	30	45	60	75	90	105
	3739.17	3739.17	7478.34	11217.51	14956.68	18695.85	22435.03	26174.20
14D+2P	0	0	16	32	48	64	80	96
	0.00	0.00	4026.80	8053.60	12080.40	16107.20	20134.00	24160.80
15D+2P	0	0	17	34	51	68	85	102
	0.00	0.00	4314.42	8628.85	12943.28	17257.71	21572.14	25886.57
16D+2P	0	0	18	36	54	72	90	90
	0.00	0.00	4602.05	9204.11	13806.17	18408.22	23010.28	23010.28
17D+2P	0	0	19	38	57	57	76	95
	0.00	0.00	4889.68	9779.37	14669.05	14669.05	19558.74	24448.43
18D+2P	0	0	20	40	60	60	80	100
	0.00	0.00	5177.31	10354.62	15531.94	15531.94	20709.25	25886.57
19D+2P	0	0	21	42	42	63	84	105
	0.00	0.00	5464.94	10929.88	10929.88	16394.82	21859.77	27324.71
20D+2P	0	0	22	44	44	66	88	88
	0.00	0.00	5752.57	11505.14	11505.14	17257.71	23010.28	23010.28
21D+2P	0	0	23	23	46	69	69	92
	0.00	0.00	6040.20	6040.20	12080.40	18120.60	18120.60	24160.80
22D+2P	0	0	24	24	48	72	72	96
	0.00	0.00	6327.82	6327.82	12655.65	18983.48	18983.48	25311.31
23D+2P	0	0	25	25	50	75	75	100
	0.00	0.00	6615.45	6615.45	13230.91	19846.37	19846.37	26461.83
24D+2P	0	0	26	26	52	52	78	104
	0.00	0.00	6903.08	6903.08	13806.17	13806.17	20709.25	27612.34
25D+2P	0	0	27	27	54	54	81	81
	0.00	0.00	7190.71	7190.71	14381.42	14381.42	21572.14	21572.14
26D+2P	0	0	28	28	56	56	84	84
	0.00	0.00	7478.34	7478.34	14956.68	14956.68	22435.03	22435.03

Table F.14 List of Capacities Corresponding to RAID6 (300 Gbytes) (continued)

Disk capacity	287.6 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
27D+2P	0	0	29	29	58	58	87	87
	0.00	0.00	7765.97	7765.97	15531.94	15531.94	23297.91	23297.91
28D+2P	0	0	30	30	60	60	90	90
	0	0.00	8053.60	8053.60	16107.20	16107.20	24160.80	24160.80

Table F.15 List of Capacities Corresponding to RAID1+0 (300 Gbytes)

Disk capacity	287.6 G bytes							
Component unit	RKS		RKAJ					
Range	1		1	2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90	105
2D+2D	4	12	28	44	60	72	88	104
	575.25	1725.77	4026.80	6327.82	8628.85	10354.62	12655.65	14956.68
3D+3D	6	12	30	42	60	72	90	102
	862.88	1725.77	4314.42	6040.20	8628.85	10354.62	12943.28	14669.05
4D+4D	8	8	24	40	56	72	88	104
	1150.51	1150.51	3451.54	5752.57	8053.60	10354.62	12655.65	14956.68
5D+5D	10	10	30	40	60	70	90	100
	1438.14	1438.14	4314.42	5752.57	8628.85	10067.00	12943.28	14381.42
6D+6D	12	12	24	36	60	72	84	96
	1725.77	1725.77	3451.54	5177.31	8628.85	10354.62	12080.40	13806.17
7D+7D	14	14	28	42	56	70	84	98
	2013.40	2013.40	4026.80	6040.20	8053.60	10067.00	12080.40	14093.80
8D+8D	0	0	16	32	48	64	80	96
	0.00	0.00	2301.02	4602.05	6903.08	9204.11	11505.14	13806.17

Table F.16 List of Capacities Corresponding to RAID1 (250 Gbytes)

Disk Capacity	245.7 G bytes						
Component Unit	RKAJAT						
Range	1		2	3	4	5	6
Total Range of Disk Drives	Min.	15 (Max)	30	45	60	75	90
1D+1D	2	14	30	44	60	74	90
	245.74	1720.22	3686.18	5406.41	7372.37	9092.59	11058.56

Table F.17 List of Capacities Corresponding to RAID5 (250 Gbytes)

Disk capacity	245.7 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
2D+1P	3	15	30	45	60	75	90
	491.49	2457.45	4914.91	7372.37	9829.83	12287.29	14744.75
3D+1P	4	12	28	44	60	72	88
	737.23	2211.71	5160.66	8109.61	11058.56	13270.28	16219.23
4D+1P	5	15	30	45	60	75	90
	982.98	2948.95	5897.90	8846.85	11795.80	14744.75	17693.70
5D+1P	6	12	30	42	60	72	90
	1228.72	2457.45	6143.64	8601.10	12287.29	14744.75	18430.94
6D+1P	7	14	28	42	56	70	84
	1474.47	2948.95	5897.90	8846.85	11795.80	14744.75	17693.70
7D+1P	8	8	24	40	56	72	88
	1720.22	1720.22	5160.66	8601.10	12041.55	15481.99	18922.43
8D+1P	9	9	27	45	54	72	90
	1965.96	1965.96	5897.90	9829.83	11795.80	15727.74	19659.67
9D+1P	10	10	30	40	60	70	90
	2211.71	2211.71	6635.14	8846.85	13270.28	15481.99	19905.42
10D+1P	11	11	22	44	55	66	88
	2457.45	2457.45	4914.91	9829.83	12287.29	14744.75	19659.67
11D+1P	12	12	24	36	60	72	84
	2703.20	2703.20	5406.41	8109.61	13516.02	16219.23	18922.43
12D+1P	13	13	26	39	52	65	78
	2948.95	2948.95	5897.90	8846.85	11795.80	14744.75	17693.70
13D+1P	14	14	28	42	56	70	84
	3194.69	3194.69	6389.39	9584.09	12778.78	15973.48	19168.18
14D+1P	15	15	30	45	60	75	90
	3440.44	3440.44	6880.88	10321.32	13761.77	17202.21	20642.65
15D+1P	0	0	16	32	48	64	80
	0.00	0.00	3686.18	7372.37	11058.56	14744.75	18430.94

Table F.18 List of Capacities Corresponding to RAID6 (250 Gbytes)

Disk capacity	245.7 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
2D+2P	4	12	28	44	60	72	88
	491.49	1474.47	3440.44	5406.41	7372.37	8846.85	10812.82
3D+2P	5	15	30	45	60	75	90
	737.23	2211.71	4423.42	6635.14	8846.85	11058.56	13270.28
4D+2P	6	12	30	42	60	72	90
	982.98	1965.96	4914.91	6880.88	9829.83	11795.80	14744.75
5D+2P	7	14	28	42	56	70	84
	1228.72	2457.45	4914.91	7372.37	9829.83	12287.29	14744.75
6D+2P	8	8	24	40	56	72	88
	1474.47	1474.47	4423.42	7372.37	10321.32	13270.28	16219.23
7D+2P	9	9	27	45	54	72	90
	1720.22	1720.22	5160.66	8601.10	10321.32	13761.77	17202.21
8D+2P	10	10	30	40	60	70	90
	1965.96	1965.96	5897.90	7863.87	11795.80	13761.77	17693.70
9D+2P	11	11	22	44	55	66	88
	2211.71	2211.71	4423.42	8846.85	11058.56	13270.28	17693.70
10D+2P	12	12	24	36	60	72	84
	2457.45	2457.45	4914.91	7372.37	12287.29	14744.75	17202.21
11D+2P	13	13	26	39	52	65	78
	2703.20	2703.20	5406.41	8109.61	10812.82	13516.02	16219.23
12D+2P	14	14	28	42	56	70	84
	2948.95	2948.95	5897.90	8846.85	11795.80	14744.75	17693.70
13D+2P	15	15	30	45	60	75	90
	3194.69	3194.69	6389.39	9584.09	12778.78	15973.48	19168.18
14D+2P	0	0	16	32	48	64	80
	0.00	0.00	3440.44	6880.88	10321.32	13761.77	17202.21
15D+2P	0	0	17	34	51	68	85
	0.00	0.00	3686.18	7372.37	11058.56	14744.75	18430.94
16D+2P	0	0	18	36	54	72	90
	0.00	0.00	3931.93	7863.87	11795.80	15727.74	19659.67
17D+2P	0	0	19	38	57	57	76
	0.00	0.00	4177.68	8355.36	12533.04	12533.04	16710.72
18D+2P	0	0	20	40	60	60	80
	0.00	0.00	4423.42	8846.85	13270.28	13270.28	17693.70
19D+2P	0	0	21	42	42	63	84
	0.00	0.00	4669.17	9338.34	9338.34	14007.51	18676.69
20D+2P	0	0	22	44	44	66	88
	0.00	0.00	4914.91	9829.83	9829.83	14744.75	19659.67
21D+2P	0	0	23	23	46	69	69
	0.00	0.00	5160.66	5160.66	10321.32	15481.99	15481.99
22D+2P	0	0	24	24	48	72	72
	0.00	0.00	5406.41	5406.41	10812.82	16219.23	16219.23
23D+2P	0	0	25	25	50	75	75
	0.00	0.00	5652.15	5652.15	11304.31	16956.47	16956.47
24D+2P	0	0	26	26	52	52	78
	0.00	0.00	5897.90	5897.90	11795.80	11795.80	17693.70
25D+2P	0	0	27	27	54	54	81
	0.00	0.00	6143.64	6143.64	12287.29	12287.29	18430.94
26D+2P	0	0	28	28	56	56	84
	0.00	0.00	6389.39	6389.39	12778.78	12778.78	19168.18

Table F.18 List of Capacities Corresponding to RAID6 (250 Gbytes) (continued)

Disk capacity	245.7 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
27D+2P	0	0	29	29	58	58	87
	0.00	0.00	6635.14	6635.14	13270.28	13270.28	19905.42
28D+2P	0	0	30	30	60	60	90
	0.00	0.00	6880.88	6880.88	13761.77	13761.77	20642.65

Table F.19 List of Capacities Corresponding to RAID1+0 (250 Gbytes)

Disk capacity	245.7 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
2D+2D	4	12	28	44	60	72	88
	491.49	1474.47	3440.44	5406.41	7372.37	8846.85	10812.82
3D+3D	6	12	30	42	60	72	90
	737.23	1474.47	3686.18	5160.66	7372.37	8846.85	11058.56
4D+4D	8	8	24	40	56	72	88
	982.98	982.98	2948.95	4914.91	6880.88	8846.85	10812.82
5D+5D	10	10	30	40	60	70	90
	1228.72	1228.72	3686.18	4914.91	7372.37	8601.10	11058.56
6D+6D	12	12	24	36	60	72	84
	1474.47	1474.47	2948.95	4423.42	7372.37	8846.85	10321.32
7D+7D	14	14	28	42	56	70	84
	1720.22	1720.22	3440.44	5160.66	6880.88	8601.10	10321.32
8D+8D	0	0	16	32	48	64	80
	0.00	0.00	1965.96	3931.93	5897.90	7863.87	9829.83

Table F.20 List of Capacities Corresponding to RAID1 (400 Gbytes)

Disk Capacity	393.4 G bytes						
Component Unit	RKAJAT						
Range	1		2	3	4	5	6
Total Range of Disk Drives	Min.	15 (Max)	30	45	60	75	90
1D+1D	2	14	30	44	60	74	90
	393.45	2754.21	5901.88	8656.10	11803.77	14557.99	17705.66

Table F.21 List of Capacities Corresponding to RAID5 (400 Gbytes)

Disk capacity	393.4 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
2D+1P	3	15	30	45	60	75	90
	786.91	3934.59	7869.18	11803.77	15738.37	19672.96	23607.55
3D+1P	4	12	28	44	60	72	88
	1180.37	3541.13	8262.64	12984.15	17705.66	21246.80	25968.31
4D+1P	5	15	30	45	60	75	90
	1573.83	4721.51	9443.02	14164.53	18886.04	23607.55	28329.06
5D+1P	6	12	30	42	60	72	90
	1967.29	3934.59	9836.48	13771.07	19672.96	23607.55	29509.44
6D+1P	7	14	28	42	56	70	84
	2360.75	4721.51	9443.02	14164.53	18886.04	23607.55	28329.06
7D+1P	8	8	24	40	56	72	88
	2754.21	2754.21	8262.64	13771.07	19279.50	24787.93	30296.36
8D+1P	9	9	27	45	54	72	90
	3147.67	3147.67	9443.02	15738.37	18886.04	25181.39	31476.74
9D+1P	10	10	30	40	60	70	90
	3541.13	3541.13	10623.40	14164.53	21246.80	24787.93	31870.20
10D+1P	11	11	22	44	55	66	88
	3934.59	3934.59	7869.18	15738.37	19672.96	23607.55	31476.74
11D+1P	12	12	24	36	60	72	84
	4328.05	4328.05	8656.10	12984.15	21640.25	25968.31	30296.36
12D+1P	13	13	26	39	52	65	78
	4721.51	4721.51	9443.02	14164.53	18886.04	23607.55	28329.06
13D+1P	14	14	28	42	56	70	84
	5114.97	5114.97	10229.94	15344.91	20459.88	25574.85	30689.82
14D+1P	15	15	30	45	60	75	90
	5508.42	5508.42	11016.85	16525.28	22033.71	27542.14	33050.57
15D+1P	0	0	16	32	48	64	80
	0.00	0.00	5901.88	11803.77	17705.66	23607.55	29509.44

Table F.22 List of Capacities Corresponding to RAID6 (400 Gbytes)

Disk capacity	393.4 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
2D+2P	4	12	28	44	60	72	88
	786.91	2360.75	5508.42	8656.10	11803.77	14164.53	17312.20
3D+2P	5	15	30	45	60	75	90
	1180.37	3541.13	7082.26	10623.40	14164.53	17705.66	21246.80
4D+2P	6	12	30	42	60	72	90
	1573.83	3147.67	7869.18	11016.85	15738.37	18886.04	23607.55
5D+2P	7	14	28	42	56	70	84
	1967.29	3934.59	7869.18	11803.77	15738.37	19672.96	23607.55
6D+2P	8	8	24	40	56	72	88
	2360.75	2360.75	7082.26	11803.77	16525.28	21246.80	25968.31
7D+2P	9	9	27	45	54	72	90
	2754.21	2754.21	8262.64	13771.07	16525.28	22033.71	27542.14
8D+2P	10	10	30	40	60	70	90
	3147.67	3147.67	9443.02	12590.69	18886.04	22033.71	28329.06
9D+2P	11	11	22	44	55	66	88
	3541.13	3541.13	7082.26	14164.53	17705.66	21246.80	28329.06
10D+2P	12	12	24	36	60	72	84
	3934.59	3934.59	7869.18	11803.77	19672.96	23607.55	27542.14
11D+2P	13	13	26	39	52	65	78
	4328.05	4328.05	8656.10	12984.15	17312.20	21640.25	25968.31
12D+2P	14	14	28	42	56	70	84
	4721.51	4721.51	9443.02	14164.53	18886.04	23607.55	28329.06
13D+2P	15	15	30	45	60	75	90
	5114.97	5114.97	10229.94	15344.91	20459.88	25574.85	30689.82
14D+2P	0	0	16	32	48	64	80
	0.00	0.00	5508.42	11016.85	16525.28	22033.71	27542.14
15D+2P	0	0	17	34	51	68	85
	0.00	0.00	5901.88	11803.77	17705.66	23607.55	29509.44
16D+2P	0	0	18	36	54	72	90
	0.00	0.00	6295.34	12590.69	18886.04	25181.39	31476.74
17D+2P	0	0	19	38	57	57	76
	0.00	0.00	6688.80	13377.61	20066.42	20066.42	26755.23
18D+2P	0	0	20	40	60	60	80
	0.00	0.00	7082.26	14164.53	21246.80	21246.80	28329.06
19D+2P	0	0	21	42	42	63	84
	0.00	0.00	7475.72	14951.45	14951.45	22427.17	29902.90
20D+2P	0	0	22	44	44	66	88
	0.00	0.00	7869.18	15738.37	15738.37	23607.55	31476.74
21D+2P	0	0	23	23	46	69	69
	0.00	0.00	8262.64	8262.64	16525.28	24787.93	24787.93
22D+2P	0	0	24	24	48	72	72
	0.00	0.00	8656.10	8656.10	17312.20	25968.31	25968.31
23D+2P	0	0	25	25	50	75	75
	0.00	0.00	9049.56	9049.56	18099.12	27148.68	27148.68
24D+2P	0	0	26	26	52	52	78
	0.00	0.00	9443.02	9443.02	18886.04	18886.04	28329.06
25D+2P	0	0	27	27	54	54	81
	0.00	0.00	9836.48	9836.48	19672.96	19672.96	29509.44
26D+2P	0	0	28	28	56	56	84
	0.00	0.00	10229.94	10229.94	20459.88	20459.88	30689.82

Table F.22 List of Capacities Corresponding to RAID6 (400 Gbytes) (continued)

Disk capacity	393.4 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
27D+2P	0	0	29	29	58	58	87
	0.00	0.00	10623.40	10623.40	21246.80	21246.80	31870.20
28D+2P	0	0	30	30	60	60	90
	0.00	0.00	11016.85	11016.85	22033.71	22033.71	33050.57

Table F.23 List of Capacities Corresponding to RAID1+0 (400 Gbytes)

Disk capacity	393.4 G bytes						
Component unit	RKAJAT						
Range	1		2	3	4	5	6
Total range of Disk drives	Min.	15 (Max)	30	45	60	75	90
2D+2D	4	12	28	44	60	72	88
	786.91	2360.75	5508.42	8656.10	11803.77	14164.53	17312.20
3D+3D	6	12	30	42	60	72	90
	1180.37	2360.75	5901.88	8262.64	11803.77	14164.53	17705.66
4D+4D	8	8	24	40	56	72	88
	1573.83	1573.83	4721.51	7869.18	11016.85	14164.53	17312.20
5D+5D	10	10	30	40	60	70	90
	1967.29	1967.29	5901.88	7869.18	11803.77	13771.07	17705.66
6D+6D	12	12	24	36	60	72	84
	2360.75	2360.75	4721.51	7082.26	11803.77	14164.53	16525.28
7D+7D	14	14	28	42	56	70	84
	2754.21	2754.21	5508.42	8262.64	11016.85	13771.07	16525.28
8D+8D	0	0	16	32	48	64	80
	0.00	0.00	3147.67	6295.34	9443.02	12590.69	15738.37

Appendix G Port Address Mapping Table

Fibre channel physical addresses are converted to target IDs (TIDs) using a conversion table. The following table shows the current limits for TIDs on various operating systems.

Table G.1 Limits for TIDs on Operating Systems

Port	HP-UX®		Solaris™		Windows NT® (SP4 or Later)	
	TID	LUN	TID	LUN	TID	LUN
Fibre	0 to 15	0 to 255	0 to 125	0 to 255	0 to 31	0 to 255

AL-PA is an abbreviation for Arbitrated Loop Physical Address and indicates the physical address for Fibre Channel. TID indicates the target ID.

Table G.2 Port Addresses for HP-UX®

C0		C1		C2		C3		C4		C5		C6		C7	
ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID
EF	0	CD	0	B2	0	98	0	72	0	55	0	3A	0	25	0
E8	1	CC	1	B1	1	97	1	71	1	54	1	39	1	23	1
E4	2	CB	2	AE	2	90	2	6E	2	53	2	36	2	1F	2
E2	3	CA	3	AD	3	8F	3	6D	3	52	3	35	3	1E	3
E1	4	C9	4	AC	4	88	4	6C	4	51	4	34	4	1D	4
E0	5	C7	5	AB	5	84	5	6B	5	4E	5	33	5	1B	5
DC	6	C6	6	AA	6	82	6	6A	6	4D	6	32	6	18	6
DA	7	C5	7	A9	7	81	7	69	7	4C	7	31	7	17	7
D9	8	C3	8	A7	8	80	8	67	8	4B	8	2E	8	10	8
D6	9	BC	9	A6	9	7C	9	66	9	4A	9	2D	9	0F	9
D5	10	BA	10	A5	10	7A	10	65	10	49	10	2C	10	08	10
D4	11	B9	11	A3	11	79	11	63	11	47	11	2B	11	04	11
D3	12	B6	12	9F	12	76	12	5C	12	46	12	2A	12	02	12
D2	13	B5	13	9E	13	75	13	5A	13	45	13	29	13	01	13
D1	14	B4	14	9D	14	74	14	59	14	43	14	27	14	--	--
CE	15	B3	15	9B	15	73	15	56	15	3C	15	26	15	--	--

Table G.3 Port Addresses for Solaris™

C0		C1		C2		C3		C4		C5		C6		C7	
ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID	ALPA	TID
EF	0	CD	16	B2	32	98	48	72	64	55	80	3A	96	25	112
E8	1	CC	17	B1	33	97	49	71	65	54	81	39	97	23	113
E4	2	CB	18	AE	34	90	50	6E	66	53	82	36	98	1F	114
E2	3	CA	19	AD	35	8F	51	6D	67	52	83	35	99	1E	115
E1	4	C9	20	AC	36	88	52	6C	68	51	84	34	100	1D	116
E0	5	C7	21	AB	37	84	53	6B	69	4E	85	33	101	1B	117
DC	6	C6	22	AA	38	82	54	6A	70	4D	86	32	102	18	118
DA	7	C5	23	A9	39	81	55	69	71	4C	87	31	103	17	119
D9	8	C3	24	A7	40	80	56	67	72	4B	88	2E	104	10	120
D6	9	BC	25	A6	41	7C	57	66	73	4A	89	2D	105	0F	121
D5	10	BA	26	A5	42	7A	58	65	74	49	90	2C	106	08	122
D4	11	B9	27	A3	43	79	59	63	75	47	91	2B	107	04	123
D3	12	B6	28	9F	44	76	60	5C	76	46	92	2A	108	02	124
D2	13	B5	29	9E	45	75	61	5A	77	45	93	29	109	01	125
D1	14	B4	30	9D	46	74	62	59	78	43	94	27	110	--	--
CE	15	B3	31	9B	47	73	63	56	79	3C	95	26	111	--	--

Table G.4 Port Addresses for Windows NT® (Fibre Board: Emulex®)

C5(Phld5)				C4(Phld4)				C3(Phld3)				C2(Phld2)				C1(Phld1)			
TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA
--	--	--	--	--	CC	15	--	--	98	15	--	--	56	15	--	--	27	15	
--	--	--	E4	30	CB	14	B1	30	67	14	72	30	55	14	3C	30	26	14	
--	--	--	E2	29	CA	13	AE	29	90	13	71	29	64	13	3A	29	25	13	
--	--	--	E1	28	C9	12	AD	28	8F	12	6E	28	53	12	39	28	23	12	
--	--	--	E0	27	C7	11	AC	27	88	11	6D	27	52	11	36	27	1F	11	
--	--	--	DC	26	C6	10	AB	26	84	10	6C	26	51	10	35	26	1E	10	
--	--	--	DA	25	C5	9	AA	25	82	9	6B	25	4E	9	34	25	1D	9	
--	--	--	D9	24	C3	8	A9	24	81	8	6A	24	4D	8	33	24	1B	8	
--	--	--	D6	23	BC	7	A7	23	80	7	69	23	4C	7	32	23	18	7	
--	--	--	D5	22	BA	6	A6	22	7C	6	67	22	4B	6	31	22	17	6	
--	--	--	D4	21	B9	5	A5	21	7A	5	66	21	4A	5	2E	21	10	5	
--	--	--	D3	20	B6	4	A3	20	79	4	65	20	49	4	2D	20	0F	4	
--	--	--	D2	19	B5	3	9F	19	76	3	63	19	47	3	2C	19	08	3	
--	--	--	D1	18	B4	2	9E	18	75	2	5C	18	46	2	2B	18	04	2	
--	EF	1	CE	17	B3	1	9D	17	74	1	5A	17	45	1	2A	17	02	1	
--	E8	0	CD	16	B2	0	9B	16	73	0	59	16	43	0	29	16	01	0	

Table G.5 Port Addresses for Windows NT® (Fibre Board: Qlogic®)

C0(PhId0)				C1(PhId1)				C2(PhId2)				C3(PhId3)			
AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID	AL PA	TID
EF	0	CD	16	B2	0	98	16	72	0	55	16	3A	0	25	16
E8	1	CC	17	B1	1	67	17	71	1	64	17	39	1	23	17
E4	2	CB	18	AE	2	90	18	6E	2	53	18	36	2	1F	18
E2	3	CA	19	AD	3	8F	19	6D	3	52	19	35	3	1E	19
E1	4	C9	20	AC	4	88	20	6C	4	51	20	34	4	1D	20
E0	5	C7	21	AB	5	84	21	6B	5	4E	21	33	5	1B	21
DC	6	C6	22	AA	6	82	22	6A	6	4D	22	32	6	18	22
DA	7	C5	23	A9	7	81	23	69	7	4C	23	31	7	17	23
D9	8	C3	24	A7	8	80	24	67	8	4B	24	2E	8	10	24
D6	9	BC	25	A6	9	7C	25	66	9	4A	25	2D	9	0F	25
D5	10	BA	26	A5	10	7A	26	65	10	49	26	2C	10	08	26
D4	11	B9	27	A3	11	79	27	63	11	47	27	2B	11	04	27
D3	12	B6	28	9F	12	76	28	5C	12	46	28	2A	12	02	28
D2	13	B5	29	9E	13	75	29	5A	13	45	29	29	13	01	29
D1	14	B4	30	9D	14	74	30	59	14	43	30	27	14	--	--
CE	15	B3	31	9B	15	73	31	56	15	3C	31	26	15	--	--

Appendix H Power Cables

This section includes descriptions of the following power cables:

- J1H
- J2H
- J2H5 and J2H10

Table H.1 J1H Power Cable

Cable Name	Part #	Name	Quantity	Model	Applicable Safety Standard/ Rating
DF-F700-J1H Power cable	1	Cable	-	PVC code	UL and CSA
	2	Connector A	1	NEMA Standard 5-15 P	For AC 125 V (13 A or 15 A)
	3	Connector B	1	EN60320-C13	For standard use

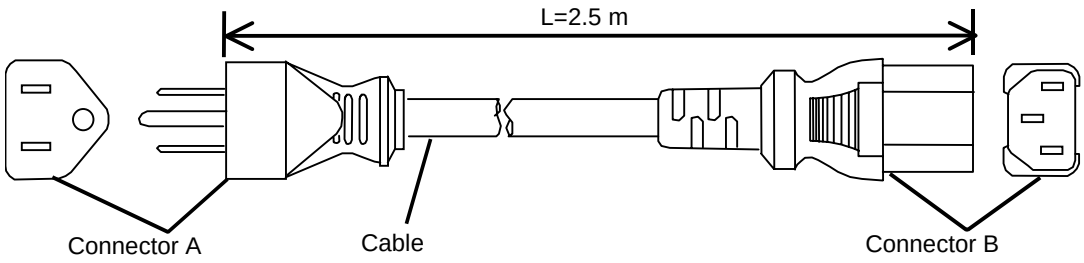


Figure H.1 J1H Power Cable

Table H.2 J2H Power Cable

Cable Name	Part #	Name	Quantity	Model	Applicable Safety Standard/ Rating
DF-F700-J2H Power cable	1	Cable	-	PVC code	UL and CSA
	2	Connector A	1	EN60324-C14	For AC 250 V (13 A or 15 A)
	3	Connector B	1	EN60324-C13	For rack frame

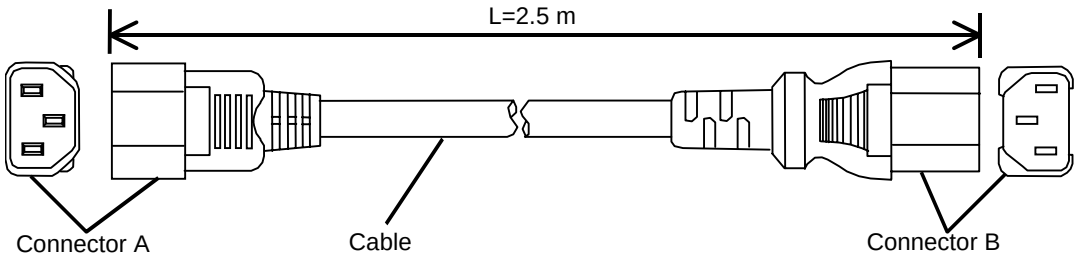


Figure H.2 J2H Power Cable

Table H.3 J2H5 and J2H10 Power Cables

Cable Name	Part #	Name	Quantity	Model	Applicable Safety Standard/ Rating
DF-F700-J2H5/J2H10 Power cable	1	Cable	-	CENELEC	UL and CSA For AC 250 V (13 A or 15 A) For rack frame
	2	Connector A	1	EN60320-C14	
	3	Connector B	1	EN60320-C13	

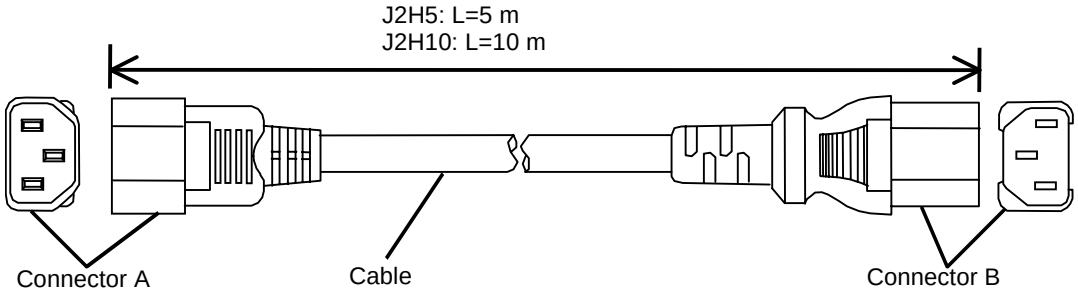


Figure H.3 J2H5 and J2H10 Power Cables

Appendix I Number of Logical Blocks

Set the number of logical blocks for each logical unit using the following multiples in accordance with RAID levels.

Note: All values of storage capacities in following tables are calculated as 1 Gbyte = 1,000,000,000 bytes.

(This definition is different from 1 Kbyte = 1,024 bytes.)

A logical unit can divide all RAID groups into up to 512. Set the number of logical blocks set for each logical unit using the following multiples in accordance with RAID levels.

Table I.1 Number of Logical Blocks and RAID Levels (continues on the next page)

RAID Level		Logical Block Number
RAID0	(2D)	4096
	(3D)	6144
	(4D)	8192
	(5D)	10240
	(6D)	12288
	(7D)	14336
	(8D)	16384
	(9D)	18432
	(10D)	20480
	(11D)	22528
	(12D)	24576
	(13D)	26624
	(14D)	28672
	(15D)	30720
	(16D)	32768
RAID1	(1D+1D)	2048

Table I.1 Number of Logical Blocks and RAID Levels (continued)

RAID Level		Logical Block Number
RAID5	(2D+1P)	4096
	(3D+1P)	6144
	(4D+1P)	8192
	(5D+1P)	10240
	(6D+1P)	12288
	(7D+1P)	14336
	(8D+1P)	16384
	(9D+1P)	18432
	(10D+1P)	20480
	(11D+1P)	22528
	(12D+1P)	24576
	(13D+1P)	26624
	(14D+1P)	28672
	(15D+1P)	30720

Table I.1 Number of Logical Blocks and RAID Levels (continued)

RAID Level		Logical Block Number
RAID 6	(2D+2P)	4096
	(3D+2P)	6144
	(4D+2P)	8192
	(5D+2P)	10240
	(6D+2P)	12288
	(7D+2P)	14336
	(8D+2P)	16384
	(9D+2P)	18432
	(10D+2P)	20480
	(11D+2P)	22528
	(12D+2P)	24576
	(13D+2P)	26624
	(14D+2P)	28672
	(15D+2P)	30720
	(16D+2P)	32768
	(17D+2P)	34816
	(18D+2P)	36864
	(19D+2P)	38912
	(20D+2P)	40960
	(21D+2P)	43008
	(22D+2P)	45056
	(23D+2P)	47104
	(24D+2P)	49152
	(25D+2P)	51200
	(26D+2P)	53248
	(27D+2P)	55296
	(28D+2P)	57344

Table I.1 Number of Logical Blocks and RAID Levels (continued)

RAID Level		Logical Block Number
RAID1+0	(2D+2D)	4096
	(3D+3D)	6144
	(4D+4D)	8192
	(5D+5D)	10240
	(6D+6D)	12288
	(7D+7D)	14336
	(8D+8D)	16384

The number of logical blocks for one parity group is shown below.

When dividing RAID groups into multiple logical units, set the sum total of the number of logical blocks of each logical unit below the number of logical blocks per parity shown below.

However, when creating multiple parity groups in each RAID group, set them below the number of logical blocks of one parity group multiplied by the number of parity groups. The number of logical blocks of one parity group is shown below.

Table I.2 Number of Logical Blocks of One Parity Group (continues on the next page)

Disk Drive Capacity	RAID Configuration	71.3 G bytes Number of Logical Blocks 1	143.3 G bytes Number of Logical Blocks 1	245.7 G bytes Number of Logical Blocks 1	292 G bytes Number of Logical Blocks 1	393.4 G bytes Number of Logical Blocks 1
RAID 0	(2D)	278,556,672	559,788,032	959,942,656	1,123,549,184	1,536,950,272
	(3D)	417,835,008	839,682,048	1,439,913,984	1,685,323,776	2,305,425,408
	(4D)	557,113,344	1,119,576,064	1,919,885,312	2,247,098,368	3,073,900,544
	(5D)	696,391,680	1,399,470,080	2,399,856,640	2,808,872,960	3,842,375,680
	(6D)	835,670,016	1,679,364,096	2,879,827,968	3,370,647,552	4,610,850,816
	(7D)	974,948,352	1,959,258,112	3,359,799,296	3,932,422,144	5,379,325,952
	(8D)	1,114,226,688	2,239,152,128	3,839,770,624	4,494,196,736	6,147,801,088
	(9D)	1,253,505,024	2,519,046,144	4,319,741,952	5,055,971,328	6,916,276,224
	(10D)	1,392,783,360	2,798,940,160	4,799,713,280	5,617,745,920	7,684,751,360
	(11D)	1,532,061,696	3,078,834,176	5,279,684,608	6,179,520,512	8,453,226,496
	(12D)	1,671,340,032	3,358,728,192	5,759,655,936	6,741,295,104	9,221,701,632
	(13D)	1,810,618,368	3,638,622,208	6,239,627,264	7,303,069,696	9,990,176,768
	(14D)	1,949,896,704	3,918,516,224	6,719,598,592	7,864,844,288	10,758,651,904
	(15D)	2,089,175,040	4,198,410,240	7,199,569,920	8,426,618,880	11,527,127,040
	(16D)	2,228,453,376	4,478,304,256	7,679,541,248	8,988,393,472	12,295,602,176
RAID 1	(1D+1D)	139,278,336	279,894,016	479,971,328	561,774,592	768,475,136
RAID 5	(2D+1P)	278,556,672	559,788,032	959,942,656	1,123,549,184	1,536,950,272
	(3D+1P)	417,835,008	839,682,048	1,439,913,984	1,685,323,776	2,305,425,408
	(4D+1P)	557,113,344	1,119,576,064	1,919,885,312	2,247,098,368	3,073,900,544
	(5D+1P)	696,391,680	1,399,470,080	2,399,856,640	2,808,872,960	3,842,375,680
	(6D+1P)	835,670,016	1,679,364,096	2,879,827,968	3,370,647,552	4,610,850,816
	(7D+1P)	974,948,352	1,959,258,112	3,359,799,296	3,932,422,144	5,379,325,952
	(8D+1P)	1,114,226,688	2,239,152,128	3,839,770,624	4,494,196,736	6,147,801,088
	(9D+1P)	1,253,505,024	2,519,046,144	4,319,741,952	5,055,971,328	6,916,276,224
	(10D+1P)	1,392,783,360	2,798,940,160	4,799,713,280	5,617,745,920	7,684,751,360
	(11D+1P)	1,532,061,696	3,078,834,176	5,279,684,608	6,179,520,512	8,453,226,496
	(12D+1P)	1,671,340,032	3,358,728,192	5,759,655,936	6,741,295,104	9,221,701,632
	(13D+1P)	1,810,618,368	3,638,622,208	6,239,627,264	7,303,069,696	9,990,176,768
	(14D+1P)	1,949,896,704	3,918,516,224	6,719,598,592	7,864,844,288	10,758,651,904
	(15D+1P)	2,089,175,040	4,198,410,240	7,199,569,920	8,426,618,880	11,527,127,040

Table I.2 Number of Logical Blocks of One Parity Group (continued)

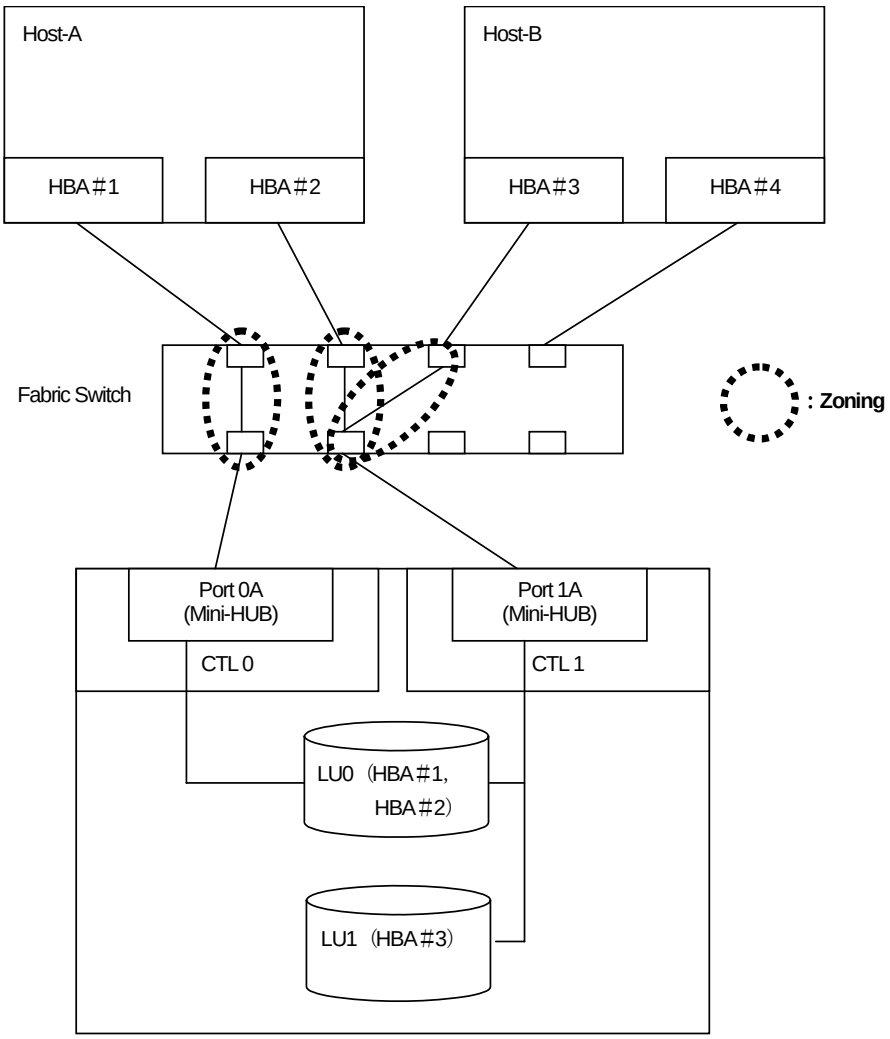
Disk Drive Capacity	RAID Configuration	71.3 G bytes Number of Logical Blocks 1	143.3 G bytes Number of Logical Blocks 1	245.7 G bytes Number of Logical Blocks 1	292 G bytes Number of Logical Blocks 1	393.4 G bytes Number of Logical Blocks 1
RAID6	(2D+2P)	278,556,672	559,788,032	959,942,656	1,123,549,184	1,536,950,272
	(3D+2P)	417,835,008	839,682,048	1,439,913,984	1,685,323,776	2,305,425,408
	(4D+2P)	557,113,344	1,119,576,064	1,919,885,312	2,247,098,368	3,073,900,544
	(5D+2P)	696,391,680	1,399,470,080	2,399,856,640	2,808,872,960	3,842,375,680
	(6D+2P)	835,670,016	1,679,364,096	2,879,827,968	3,370,647,552	4,610,850,816
	(7D+2P)	974,948,352	1,959,258,112	3,359,799,296	3,932,422,144	5,379,325,952
	(8D+2P)	1,114,226,688	2,239,152,128	3,839,770,624	4,494,196,736	6,147,801,088
	(9D+2P)	1,253,505,024	2,519,046,144	4,319,741,952	5,055,971,328	6,916,276,224
	(10D+2P)	1,392,783,360	2,798,940,160	4,799,713,280	5,617,745,920	7,684,751,360
	(11D+2P)	1,532,061,696	3,078,834,176	5,279,684,608	6,179,520,512	8,453,226,496
	(12D+2P)	1,671,340,032	3,358,728,192	5,759,655,936	6,741,295,104	9,221,701,632
	(13D+2P)	1,810,618,368	3,638,622,208	6,239,627,264	7,303,069,696	9,990,176,768
	(14D+2P)	1,949,896,704	3,918,516,224	6,719,598,592	7,864,844,288	10,758,651,904
	(15D+2P)	2,089,175,040	4,198,410,240	7,199,569,920	8,426,618,880	11,527,127,040
	(16D+2P)	2,228,453,376	4,478,304,256	7,679,541,248	8,988,393,472	12,295,602,176
	(17D+2P)	2,367,731,712	4,758,198,272	8,159,512,576	9,550,168,064	13,064,077,312
	(18D+2P)	2,507,010,048	5,038,092,288	8,639,483,904	10,111,942,656	13,832,552,448
	(19D+2P)	2,646,288,384	5,317,986,304	9,119,455,232	10,673,717,248	14,601,027,584
	(20D+2P)	2,785,566,720	5,597,880,320	9,599,426,560	11,235,491,840	15,369,502,720
	(21D+2P)	2,924,845,056	5,877,774,336	10,079,397,888	11,797,266,432	16,137,977,856
	(22D+2P)	3,064,123,392	6,157,668,352	10,559,369,216	12,359,041,024	16,906,452,992
	(23D+2P)	3,203,401,728	6,437,562,368	11,039,340,544	12,920,815,616	17,674,928,128
	(24D+2P)	3,342,680,064	6,717,456,384	11,519,311,872	13,482,590,208	18,443,403,264
	(25D+2P)	3,481,958,400	6,997,350,400	11,999,283,200	14,044,364,800	19,211,878,400
	(26D+2P)	3,621,236,736	7,277,244,416	12,479,254,528	14,606,139,392	19,980,353,536
	(27D+2P)	3,760,515,072	7,557,138,432	12,959,225,856	15,167,913,984	20,748,828,672
RAID1+0	(2D+2D)	278,556,672	559,788,032	959,942,656	1,123,549,184	1,536,950,272
	(3D+3D)	417,835,008	839,682,048	1,439,913,984	1,685,323,776	2,305,425,408
	(4D+4D)	557,113,344	1,119,576,064	1,919,885,312	2,247,098,368	3,073,900,544
	(5D+5D)	696,391,680	1,399,470,080	2,399,856,640	2,808,872,960	3,842,375,680
	(6D+6D)	835,670,016	1,679,364,096	2,879,827,968	3,370,647,552	4,610,850,816
	(7D+7D)	974,948,352	1,959,258,112	3,359,799,296	3,932,422,144	5,379,325,952
	(8D+8D)	1,114,226,688	2,239,152,128	3,839,770,624	4,494,196,736	6,147,801,088

Appendix J Using LUN Security or LUN Management on a Fabric Switch Connection

When using LUN Manager on a Fabric Switch connection:

- When connecting to the servers (HBA) or exchanging the HBA, connect to the servers (HBA) that access the Disk Array after the LUN Security or LUN Management settings, including WWN registration, are completed.
- Zoning on Fabric Switch must be set as shown below to disturb the access from HBA that cannot be accessed from the Disk Array by LUN Manager.

J.1 When an FC Interface Board is Not Added to the Control Unit



J.1 When an FC Interface Board is Added to the Control Unit

